

CONNECTICUT

Commercial Driver's Manual

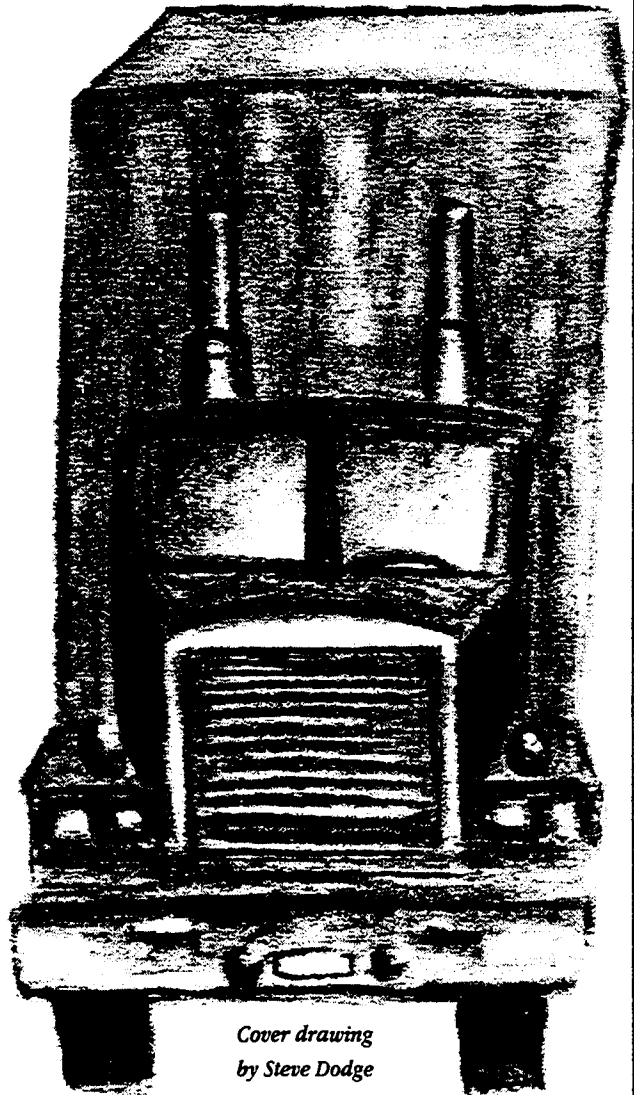
Commercial Vehicle Safety

THE DEPARTMENT
OF MOTOR VEHICLES

60 State Street
Wethersfield, Conn. 06161
<http://dmvct.org>

John G. Rowland
Governor

Jose' O. Salinas
Commissioner of Motor Vehicles



*Cover drawing
by Steve Dodge*



STATE OF CONNECTICUT
Department of Motor Vehicles
OFFICE OF THE COMMISSIONER

JOSÉ O. SALINAS
Commissioner

Telephone (860) 263-5015
Facsimile (860) 263-5550

Dear Applicant:

The safe operation of commercial vehicles on Connecticut highways is a crucial concern of mine. If we pay strict attention to the safety precautions needed in the operation of these vehicles then I know we can make Connecticut highways the safest in the nation.

This manual, the Connecticut Commercial Driver's Manual, explains in clear language the requirements for obtaining the Commercial Driver's License from the State of Connecticut. It also provides information on the principles of the safe and lawful operation of a commercial motor vehicle. The manual covers minimum requirements for safe driving, transporting cargo, transporting passengers, safe operation of air brakes, single transporters, double and triple transporters and the transportation of hazardous material.

I urge you to review each section carefully and to be familiar with its contents. Thank you for helping to make Connecticut roads safe for both commercial and passenger vehicles.

Sincerely,

José O. Salinas
José O. Salinas
Commissioner

COMMERCIAL DRIVER'S LICENSES and COMMERCIAL MOTOR VEHICLES

The purpose of this manual is to provide the reader with a general familiarity with the principles of safe and lawful operation of a commercial motor vehicle.

The contents of this manual are not intended to serve as a precise statement of the General Statutes of the State of Connecticut pertaining to the operation of a commercial motor vehicle and should not be understood by the reader as such.

This manual is designed to help you be a better driver. It will not tell you how to drive. Only a good teacher and a lot of practice can do that. But, it will tell you things to do to help keep you from having accidents.

THIS MANUAL COVERS THE MINIMUM REQUIREMENTS FOR:

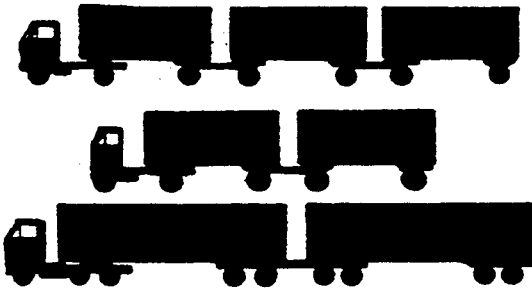
Driving Safely	(Section 2)
Transporting Cargo Safely	(Section 3)
Transporting Passengers	(Section 4)
Air Brakes	(Section 5)
Combination Vehicles	(Section 6)
Doubles and Triples	(Section 7)
Tank Vehicles	(Section 8)
Hazardous Materials	(Section 9 - Ask for Hazmat Section booklet)

HOW TO STUDY FOR THE TESTS:

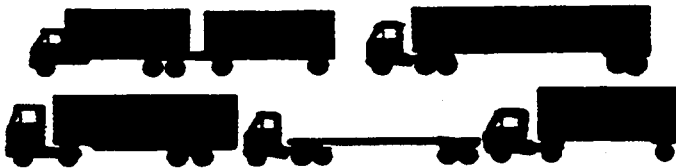
There are sample test questions at the end of each section. After reading each section, check your knowledge by answering the questions. You must study all sections pertaining to the class of license you wish to obtain.

HOW TO USE THIS MANUAL

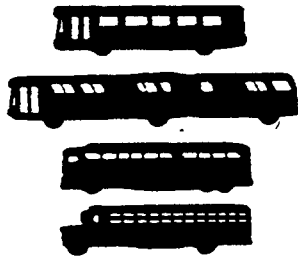
Select the vehicle(s) you intend to drive and study the corresponding sections.¹



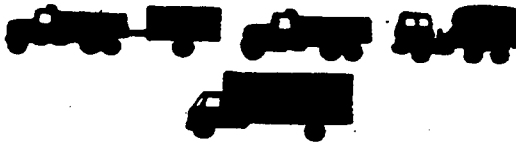
Section 1: Introduction
Section 2: Driving Safely
Section 3: Transporting Cargo Safely¹
Section 5: Air Brakes
Section 6: Combination Vehicles
Section 7: Doubles and Triples



Section 1: Introduction
Section 2: Driving Safely
Section 3: Transporting Cargo Safely¹
Section 5: Air Brakes
Section 6: Combination Vehicles
(except double/triple trailer information)



Section 1: Introduction
Section 2: Driving Safely
Section 3: Transporting Cargo Safely¹
Section 4: Transporting Passengers
Section 5: Air Brakes (if applicable)



Section 1: Introduction
Section 2: Driving Safely
Section 3: Transporting Cargo Safely¹
Section 5: Air Brakes (if applicable)

(CDL required only if these vehicles are used to carry hazardous materials)



Section 1: Introduction
Section 2: Driving Safely
Section 3: Transporting Cargo Safely¹

¹If you want a tank vehicle endorsement, study Section 8: Tank Vehicles.

TABLE OF CONTENTS

SECTION 1 : INTRODUCTION

1.1 General Information	1-1
1.2 Commercial Driver's License Tests	1-4
1.3 Other Safety Act Rules	1-15

SECTION 2: DRIVING SAFELY

2.1 Vehicle Inspection	2-1
2.2 7-Step Inspection Method	2-5
2.3 Basic Control of Your Vehicle	2-16
2.4 Shifting Gears	2-18
2.5 Seeing	2-20
2.6 Communicating	2-22
2.7 Controlling Speed	2-25
2.8 Managing Space	2-29
2.9 Driving at Night	2-33
2.10 Driving in Fog	2-36
2.11 Driving in Winter	2-36
2.12 Driving in Very Hot Weather	2-39
2.13 Railroad Crossings	2-40
2.14 Mountain Driving	2-41
2.15 Seeing Hazards	2-43
2.16 Emergencies	2-47
2.17 Skid Control and Recovery	2-51
2.18 Accident Procedures	2-52
2.19 Fires	2-54
2.20 Staying Alert and Fit to Drive	2-56
2.21 Hazardous Materials Rules for All Commercial Drivers	2-59

SECTION 3: TRANSPORTING CARGO SAFELY

3.1 Inspecting Cargo	3-1
3.2 Weight & Balance	3-2
3.3 Securing Cargo	3-3
3.4 Other Cargo Needing Special Attention	3-5

SECTION 4: TRANSPORTING PASSENGERS

4.1 Pre-Trip Inspection	4-1
4.2 Loading and Trip Start	4-2
4.3 On the Road	4-3
4.4 After-Trip Vehicle Inspection	4-5
4.5 Prohibited Practices	4-6
4.6 Use of Brake-Door Interlocks	4-6

SECTION 5: AIR BRAKES

5.1 The Parts of an Air Brake System	5-1
5.2 Dual Air Brake	5-3
5.3 Inspecting Air Brake Systems	5-7
5.4 Using Air Brakes	5-9

SECTION 6: COMBINATION VEHICLES

6.1 Driving Combination Vehicles Safely	6-1
6.2 Combination Vehicle Air Brakes	6-5
6.3 Coupling and Uncoupling	6-8
6.4 Inspecting a Combination Vehicle	6-10
6.5 Pre-Trip Inspection	6-14

SECTION 7: DOUBLES AND TRIPLES

7.1 Pulling Double / Triple Trailers	7-1
7.2 Coupling and Uncoupling	7-2
7.3 Inspecting Doubles and Triples	7-4
7.4 Doubles/Triples Air Brake Check	7-6

SECTION 8: TANK VEHICLES

8.1 Inspecting Tank Vehicles	8-1
8.2 Driving Tank Vehicles	8-2
8.3 Safe Driving Rules	8-3

SECTION 9: HAZARDOUS MATERIALS

Ask for Hazmat Section booklet.

TABLE OF ILLUSTRATIONS

Figure 1: Parallel Parking at the Curb	1-12
Figure 2: Forward and Backward thru Alley	1-12
Figure 3: Backing into Alley Dock - Jack-Knife (Class A)	1-13
Figure 4: Backing into Alley Dock - Jack-Knife (Class B)	1-13
Figure 5: Examples of Steering System Key Parts	2-3
Figure 6: Key Suspension Parts	2-4
Figure 7: Air Suspension Parts	2-4
Figure 8: Safety Defect - Broken Leaf in Leaf Spring	2-5
Figure 9: Straight Truck / School Bus (front engine)	2-7
Figure 10: Coach / Transit Bus (rear engine)	2-8
Figure 11: Tractor Trailer	2-9
Figure 12: Warning Devices, Straight Roadway	2-24
Figure 13: Warning Devices, Curve or Hill	2-24
Figure 14: Warning Devices, One-Way or Divided Highway	2-25
Figure 15: Right Turns	2-32
Figure 16: Left Turns	2-33
Figure 17: Tractor Jackknife	2-52
Figure 18: Hazardous Materials Hazard Class / Division Table	2-60
Figure 19: Examples of Hazardous Materials Labels	2-61
Figure 20: Examples of Loading Cargo	3-3
Figure 21: Examples of Hazardous Materials Labels	4-3
Figure 22: Manual Drain Valve	5-2
Figure 23: S-Cam Air Brakes	5-3
Figure 24: Influence of Combination Type on Rearward Amplification	6-2
Figure 25: Tractor Jackknife	6-3
Figure 26: Trailer Jackknife	6-3
Figure 27: Offtracking in a 90-degree turn	6-4
Figure 28: Right Turns	6-5
Figure 29: Trailer Kingpin	6-10

SECTION 1 : INTRODUCTION

This Section Covers

General Information
Commercial Driver's License Tests
Other Safety Rules

1.1 GENERAL INFORMATION

Commercial Motor Vehicle Safety Act of 1986

On October 26, 1986, Congress passed the Commercial Motor Vehicle Safety Act of 1986. This law requires each State to meet the same minimum standards for commercial driver licensing. The minimum standards require commercial motor vehicle drivers to get a Commercial Driver's License (CDL). You must have a CDL to drive a Commercial Motor Vehicle (CMV). A commercial motor vehicle is defined as a motor vehicle designed or used to transport passengers or property if the vehicle:

Commercial Motor Vehicle Definition

- Has a gross vehicle weight rating of 26,001 or more pounds; or
- Is designed to transport 16 or more passengers, including the driver; or is designed to transport more than 10 passengers, including the driver, and used to transport students under the age of twenty-one years to and from school; or
- Is transporting hazardous materials and is required to be placarded.

Vehicles Exempt From CDL

- Vehicles used for farming within one hundred and fifty miles of such farm
- Fire fighting apparatus
- Authorized emergency vehicles
- Recreational vehicles
- Military vehicles operated by military personnel.

Legal Age

- You must be at least 18 years of age to apply for a learner's permit
- You must be at least 18 years of age to get a CDL
- You must be at least 21 years of age to haul hazardous materials
- You must be at least 21 years of age to drive interstate.

Physical Requirements

You must certify, on the application form for a CDL, that you meet all the physical requirements in accordance with CFR Title 49, Part 391.41, as amended. Your certification will be required before you take any knowledge tests for a CDL. Proof that you meet the physical requirements as set forth in CFR Title 49, Part 391.41, as amended, must be carried with you when operating a commercial motor vehicle. You may be required to show proof that you meet these physical requirements when you renew your CDL.

Connecticut's Laws on Driving and Alcohol

Connecticut has strict laws which prohibit the operation of any motor vehicle while under the influence of alcohol. These laws are extremely important to you as a commercial driver. Drunk driving is a crime for which you may be arrested and taken into custody. If you are convicted in court, you will be subject to fines and imprisonment.

It is illegal to operate a CMV if your Blood Alcohol Concentration (BAC) is .04% or more. You will lose your CDL for one year for your first offense. You will lose it for life for your second offense. If your blood alcohol concentration is less than 0.04% but you have any detectable amount, you will be put out-of-service for 24 hours.

Implied Consent

In addition, if you are arrested for driving under the influence, you are subject to the law known as implied consent. Because you hold an operator's license, you are deemed to have consented to a chemical alcohol test. You will be asked by the arresting officer to submit to a blood, breath or urine test. You may refuse to submit to such test; but if you do, your operator's license will be suspended by the Commissioner of Motor Vehicles for not less than six (6) months. If you fail such test, your license will be suspended for not less than ninety (90) days. These suspensions are **in addition** to any sentences which may be imposed by the court.

Disqualifications

Any person who is disqualified shall not drive a commercial motor vehicle. An employer shall not knowingly allow, require, permit, or authorize any person who is disqualified to drive a commercial motor vehicle.

Serious Traffic Violations

You will lose your CDL:

- For at least 60 days if you have committed 2 serious traffic violations within a 3-year period involving a CMV.
- For at least 120 days for 3 serious traffic violations within a 3-year period.

"Serious traffic violations" are excessive speeding (15 mph or more above the posted limit), reckless driving, improper or erratic lane changes, following a vehicle too closely, and traffic offenses committed in a CMV in connection with fatal traffic accidents.

Out-Of-Service Orders

You will lose your CDL for at least ninety days for a first offense if you violate an Out-Of-Service Order or at least one hundred and eighty days for a first offense if you violate an Out-Of-Service Order while operating a CMV that is required to be placarded for hazardous materials.

Other Offenses

You will lose your CDL for at least one year for a first offense:

- If you drive a CMV under the influence of alcohol or a controlled substance (for example, illegal drugs).
- If you leave the scene of an accident involving a CMV you were driving.
- If you use a CMV to commit a felony.

If the offense occurs while you are operating a CMV that is required to be placarded for hazardous materials, you will lose your CDL for at least 3 years. You will lose your CDL for life for a second offense. You will also lose your CDL for life if you use a CMV to commit a felony involving controlled substances.

Classifications

A commercial driver's license or "CDL" is a license issued with the following classifications, endorsements and restrictions:

- A** Any combination of vehicles with a (gross combined weight rating) GCWR of 26,001 or more pounds provided the (gross vehicle weight rating) GVWR of the vehicle(s) being towed is in excess of 10,000 pounds. (Holders of class A licenses may, with any appropriate endorsements and/or permits, operate all vehicles within classes B and C.)
- B** Any single vehicle with a GVWR of 26,001 or more pounds, or any such vehicle towing a vehicle not in excess of 10,000 pounds GVWR. (Holders of class B licenses may, with any appropriate endorsements and/or permits, operate all vehicles within class C.)
- C** Any single vehicle, or combination of vehicles, that does not meet the definition of class A or class B as contained herein, but that is designed to transport 16 or more passengers, including the driver, or is placarded for hazardous materials; or is designed to transport more than 10 passengers, including the driver, and used to transport students under the age of twenty-one years to and from school.
- M** Combined with any other class evidences that the holder is licensed to operate a motorcycle.

Endorsements

- H** Hazardous Material
- N** Liquid Bulk/Cargo Tank
- P** Passenger Transportation
- S** School Bus *
- T** Doubles/Triples
- X** N & H Combined

Restrictions

- B** Corrective Lenses
- C** Mechanical Aid
- D** Prosthetic Aid
- E** Automatic Transmission
- F** Outside Mirror (In addition to statutory requirements)
- J** Weight Restricted (Under 18,001 pounds GVWR)
- K** CDL Intrastate Only
- L** Vehicles without air brakes
- T** Taxicab, service bus, motor vehicle in livery service, coach, motor bus *
- U** Hearing Aid Required
- V** STVs and vehicles listed under restriction T *
- W** Medical Waiver Required *
- Z** Restricts the driver to school buses (Effective 10/1/97)

- * Effective July 1, 1994, endorsement and/or restriction codes will be printed on the license document in lieu of issuing a separate Public Passenger Transportation Permit (PPTP) document. The appropriate endorsement and/or restriction code on the license document will indicate the type of motor vehicles the licensee is eligible to operate for public passenger transportation.

Expiration

Your commercial driver's license will expire within a period not to exceed four years following the date of your next birthday.

Renewals

Before your license is due to expire, you will receive a license renewal application in the mail. Your license must be renewed before your birth date. You may renew your CDL at any full-service office of the Department of Motor Vehicles. Your commercial driver's license will not be renewed if it is disqualified in any state.

You will not get your renewal application if you have changed your address and did not notify the Department of Motor Vehicles of the new address. See the **Change of Name or Address** paragraph.

If you do not get your commercial driver's license renewal application in the mail, please contact any full-service office of the Department of Motor Vehicles.

Renewal of Hazardous Materials Endorsement

CDL operators who wish to maintain their license endorsement to haul hazardous materials or hazardous waste must pass the hazardous materials endorsement test within two years prior to your renewal. This requirement will ensure that drivers are updated on any new safety regulations relative to the transportation of hazardous materials or hazardous waste.

Lost CDL

If your CDL is lost or destroyed, you must apply for a duplicate. Duplicate CDL's may be obtained at any full-service motor vehicle branch office. You must bring with you two forms of identification, one of which must be a certified copy of your birth certificate.

Change of Name or Address

State law requires you to notify the Department of Motor Vehicles within 48 hours if you change your name or address. Change of name and/or address forms are available at any motor vehicle branch office.

1.2 COMMERCIAL DRIVER'S LICENSE TESTS

Knowledge Tests

You will be required to take one or more knowledge tests depending on the class of license and endorsements you need. The knowledge tests and skills test are paid at this time. The CDL knowledge tests include:

- The **General Knowledge Test** must be taken by all applicants.
- The **Passenger Transportation Test** must be taken by all applicants intending to operate a commercial motor vehicle designed to transport passengers.
- The **Air Brake Test** must be taken by all applicants intending to drive vehicles equipped with air brakes.

- The **Combination Vehicles Test** must be taken by all applicants intending to drive combination vehicles.
- The **Hazardous Materials Test** must be taken by all applicants intending to haul hazardous material or hazardous waste.
- The **Tanker Test** must be taken by all applicants intending to haul liquids in bulk (1,000 gallons or more).
- The **Doubles/Triples Test** must be taken by all applicants intending to pull double or triple trailers.

What to Bring to the Knowledge Tests

- Your current Connecticut operator's license.
- Your social security card.
- A recent color photograph of yourself. You must provide a photograph of yourself which must be no smaller than 1 1/4" X 1 3/4" and no larger than 2 1/2 " X 3 1/4". This photograph will be attached to and remain with your application.
- Funds to cover the appropriate fees for the knowledge tests, the Commercial Driver's Instruction Permit and the skills test.

If you presently hold a license from another state, you will be required to obtain a Connecticut license prior to applying for a Connecticut CDL.

Where to Take the Knowledge Tests

You may take the CDL knowledge tests at any full-service motor vehicle branch office. Following is a list of the office addresses where the knowledge tests will be given on a walk-in basis. You should arrive at the office at least an hour before closing.

DMV Branch Offices

Bridgeport

1825 East Main Street
Bridgeport, CT 06608

Enfield

4 Pearson Way
Enfield, CT 06082

New Britain

1185 West Main Street
New Britain, CT 06053

Norwalk

540 Main Street
Norwalk, CT 06851

Old Saybrook

7 Custom Drive
Old Saybrook, CT 06575

Wethersfield

60 State Street
Wethersfield, CT 06161

Danbury

25 Tamarack Road
Danbury, CT 06811

Hamden

1985 State Street
Hamden, CT 06517

Northwestern ¹

151 Torrington Road
Winsted, CT 06098

Norwich

173 Salem Turnpike
Norwich, CT 06360

Waterbury

1625 Thomaston Avenue
Waterbury, CT 06714

Willimantic

1557 West Main Street
Willimantic, CT 06226

¹ NOTE: The Northwestern DMV branch office is open Tuesdays, Thursdays and Saturdays.

Commercial Driver's Instruction Permit (CDIP)

After you pass the required knowledge tests, you will obtain a Commercial Driver's Instruction Permit, CDIP. This will allow you to operate a commercial motor vehicle on the road while being instructed by an operator that holds a valid and current CDL with the proper class and endorsements for the vehicle that is being used for the instructions.

Skills Test Appointment

After you have passed the CDL knowledge test(s), you will be assigned a site and date for the skills test or you may phone 566-4710 or 1-800-842-8222 at a later date to schedule an appointment.

What to Bring to the CDL Skills Test

- You must bring your appointment confirmation letter.
- The validated goldenrod copy of the application (form R-229a) showing that the skills test fee has been paid at a DMV office.
- Current operator's license.
- Commercial Driver's Instruction Permit (CDIP) for all CDL applicants, upgrade or new. A CDIP is valid for six months. The CDIP may be renewed once within a two year period. The two year period starts on the date the original CDIP is issued.
- A mechanically safe commercial motor vehicle, representative of the class of license you wish to obtain. If you have taken and passed the written air brake test, the vehicle which is used for the skills test must be equipped with air brakes otherwise you will receive a CDL restricted to vehicles without air brakes. A qualified licensed operator must accompany you to the test site.
- The current registration certificate for the vehicle. If the vehicle is leased or rented you must also bring the lease agreement or rental contract and a letter from the lessee or rentee that the vehicle can be used to test an applicant for a commercial driver's license test.

NOTE: If the skills test appointment is canceled due to inclement weather or departmental needs, it is the driver's responsibility to make another appointment.

The Three Part Skills Test

There are three parts to the CDL skills test: the pre-trip inspection, the basic control (static) test and the road test. **You must take the skills test in the type of vehicle for which you wish to be licensed.**

Part 1: Pre-Trip Inspection

Purpose. To see if you know if the vehicle is safe to drive.

Test Procedure. You will perform a pre-trip inspection of the vehicle to be used for the driving test and explain to the examiner what is being inspected, and why. The examiner will mark on a scoring form each item that you correctly inspect. This manual explains what you need to inspect.

It is the responsibility of the driver to ensure that the vehicle is properly equipped. If the vehicle does not pass the pre-trip inspection, the skills test will not be continued and you will be rescheduled for another skills test.

Part 2: Basic Control (Static) Test

Purpose. To evaluate your basic skill in controlling and maneuvering the vehicle.

Test Procedure. The basic control (static) test consists of various exercises marked by bicycle flags. These exercises are explained in detail further on in this section.

The examiner will explain to you how each exercise is to be done. You will be scored on your ability to properly perform each exercise.

You should practice these exercises. The skills you learn will help you pass the basic control static test and be a better driver.

Part 3: Road Test

Purpose. To evaluate your ability to drive safely in on-the-road situations.

Test Procedure. The road test is taken over a route specified by the Department of Motor Vehicles. The route will include, wherever possible, left and right turns, intersections, railroad crossings, curves, up and down grades, rural or semi-rural roads, city multi-lane streets, and highway driving.

You will drive over the test route following directions given by the examiner. The examiner will score you on specific tasks such as turns, merging into traffic, lane changes, and speed control. The examiner will also score you on whether you correctly complete tasks such as signaling, looking for hazards, lane positioning, shifting, steering, accelerating, braking, obeying signs and signals, and use of auxiliary equipment.

NOTE: Failure of part 1, 2, or 3 will constitute a failure of the entire skills test.

Samples of the scoring sheets (forms R-296 and R-297), that are used by the examiner to evaluate your performance during the skills test, are shown on the following pages.

Time Allowances

The applicant is expected to complete each part of the CDL skills test within the following times.

CDL A and Class 1 skills test:

1. Uncoupling and coupling - 15 minutes
2. Pre-trip inspection - 15 minutes
3. Static test - 15 minutes
4. Road test - 15 minutes (average).

CDL B and Class 2 skills test:

1. Pre-trip inspection
 - a. Trucks - 10 minutes
 - b. Buses - 15 minutes
2. Static test - 10 minutes
3. Road test - 15 minutes (average).

COMMERCIAL ROAD TEST EVALUATION REPORT
R-296 REV. 3-94

STATE OF CONNECTICUT
DEPARTMENT OF MOTOR VEHICLES
BRANCH OPERATIONS DIVISION

NAME OF APPLICANT		(Last)	(First)	(M.I.)	DATE OF BIRTH
ROAD TEST INFORMATION	DATE	TIME (BEGINNING)		TIME (ENDING)	RESULT (Check one) <input type="checkbox"/> PASS <input type="checkbox"/> FAIL
ROAD CONDITIONS	<input type="checkbox"/> DRY <input type="checkbox"/> WET <input type="checkbox"/> ICY <input type="checkbox"/> SNOW	TRAFFIC CONDITIONS		<input type="checkbox"/> LIGHT <input type="checkbox"/> MEDIUM <input type="checkbox"/> HEAVY	
WEATHER CONDITIONS	<input type="checkbox"/> CLEAR <input type="checkbox"/> RAIN <input type="checkbox"/> SNOW <input type="checkbox"/> OTHER				
CATEGORY	ITEM	TOTAL X's	MANEUVER SCORE (✓ OR X)		
Category 1 (STATIC TEST)	PARALLEL PARK		<input type="checkbox"/> RUN OVER/DISLODGE FLAG <input type="checkbox"/> TIRE OVER CURB LINE	<input type="checkbox"/> CROSSING LINE #1/2 2 FLAGS <input type="checkbox"/> CROSSING LINE #4/5 5 FLAGS	<input type="checkbox"/> INCOMPLETE MANEUVERS <input type="checkbox"/> OVER THREE ATTEMPTS
	FWD/BKWD - ALLEY		<input type="checkbox"/> RUN OVER/TOUCH FLAG <input type="checkbox"/> TIRE OVER CURB LINE	<input type="checkbox"/> CROSSING LINE #1/2 2 FLAGS <input type="checkbox"/> CROSSING LINE #9/10 10 FLAGS	<input type="checkbox"/> INCOMPLETE MANEUVERS <input type="checkbox"/> OVER THREE ATTEMPTS
	ALLEY DOCK JACK-KNIFE		<input type="checkbox"/> RUN OVER/DISLODGE FLAG <input type="checkbox"/> CROSSING LINE #6/7 7 FLAGS	<input type="checkbox"/> TRACTOR NOT IN ANGLE TO TRAILER <input type="checkbox"/> TRAILER NOT SQUARE WITHIN 12 INCHES	<input type="checkbox"/> INCOMPLETE MANEUVERS <input type="checkbox"/> OVER THREE ATTEMPTS
	TOTAL CATEGORY 1		COMMENTS:		
Category 2 (GENERAL DRIVING BEHAVIORS)	SHIFTING		<input type="checkbox"/> NO GRINDING <input type="checkbox"/> GEAR SELECTION <input type="checkbox"/> SMOOTH <input type="checkbox"/> OTHER		
	BRAKING		<input type="checkbox"/> SMOOTH <input type="checkbox"/> TIMING <input type="checkbox"/> NO RIDING <input type="checkbox"/> OTHER		
	CLUTCH		<input type="checkbox"/> PROPERLY <input type="checkbox"/> NO COASTING <input type="checkbox"/> OTHER		
	OBEY ALL LAWS		<input type="checkbox"/> STOP POSITION <input type="checkbox"/> LIGHTS <input type="checkbox"/> PASSING <input type="checkbox"/> OTHER		
	SPEED		<input type="checkbox"/> OBEY SPEED <input type="checkbox"/> TOO SLOW <input type="checkbox"/> RIGHT FOR CONDITIONS <input type="checkbox"/> OTHER		
	TRAFFIC		<input type="checkbox"/> ZONES <input type="checkbox"/> PEDESTRIAN <input type="checkbox"/> BLIND SPOTS <input type="checkbox"/> OTHER		
TOTAL CATEGORY 2		COMMENTS:			
Category 3 (INTERSECTION)	STOP		<input type="checkbox"/> TRAFFIC CHECK <input type="checkbox"/> DECELERATE <input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> GAP <input type="checkbox"/> STOP POSITION <input type="checkbox"/> FULL STOP		
	DRIVE THROUGH		<input type="checkbox"/> TRAFFIC CHECK <input type="checkbox"/> YIELD <input type="checkbox"/> NO GEAR CHANGE <input type="checkbox"/> OTHER		
	TOTAL CATEGORY 3		COMMENTS:		
Category 4 (LEFT TURN)	APPROACH		<input type="checkbox"/> TRAFFIC CHECK <input type="checkbox"/> SIGNAL <input type="checkbox"/> SET UP FOR TURN <input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> OTHER		
	TURNING		<input type="checkbox"/> TOO WIDE/SHORT <input type="checkbox"/> GEAR CHANGE <input type="checkbox"/> HAND ON WHEEL <input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> OTHER		
	COMPLETION		<input type="checkbox"/> TRAFFIC CHECK <input type="checkbox"/> CORRECT LANE <input type="checkbox"/> SMOOTH ACCELERATION <input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> OTHER		
	TOTAL CATEGORY 4		COMMENTS:		
Category 5 (RIGHT TURN)	APPROACH		<input type="checkbox"/> TRAFFIC CHECK <input type="checkbox"/> SIGNAL <input type="checkbox"/> SET UP FOR TURN <input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> OTHER		
	TURNING		<input type="checkbox"/> TOO WIDE/SHORT <input type="checkbox"/> GEAR CHANGE <input type="checkbox"/> HAND ON WHEEL <input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> OTHER		
	COMPLETION		<input type="checkbox"/> TRAFFIC CHECK <input type="checkbox"/> CORRECT LANE <input type="checkbox"/> SMOOTH ACCELERATION <input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> OTHER		
	TOTAL CATEGORY 5		COMMENTS:		
Category 6 (LANE CHANGE)	LEFT		<input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> SIGNAL <input type="checkbox"/> SMOOTH LANE CHANGE <input type="checkbox"/> GAP <input type="checkbox"/> OTHER		
	RIGHT		<input type="checkbox"/> MIRROR CHECK <input type="checkbox"/> SIGNAL <input type="checkbox"/> SMOOTH LANE CHANGE <input type="checkbox"/> GAP <input type="checkbox"/> OTHER		
	TOTAL CATEGORY 6		COMMENTS:		
Category 7 (STOP/START ON GRADE)	STOP		<input type="checkbox"/> SIGNALS <input type="checkbox"/> PULL TO RIGHT <input type="checkbox"/> SET EMERGENCY BRAKE <input type="checkbox"/> DECELERATE <input type="checkbox"/> OTHER		
	RESUME		<input type="checkbox"/> TRAFFIC CHECK <input type="checkbox"/> SIGNAL <input type="checkbox"/> ACCELERATE <input type="checkbox"/> OTHER		
	TOTAL CATEGORY 7		COMMENTS:		
Category 8 (RAILROAD CROSSING)	HAZARDOUS MATERIALS		<input type="checkbox"/> STOP POSITION <input type="checkbox"/> HAZARD LIGHTS <input type="checkbox"/> NO GEAR CHANGE <input type="checkbox"/> OTHER		
	BUSES		<input type="checkbox"/> STOPPED <input type="checkbox"/> LOOKED <input type="checkbox"/> NO GEAR CHANGE <input type="checkbox"/> OTHER		
	TOTAL CATEGORY 8		COMMENTS:		

SCORING SYSTEM

A check (✓) means satisfactory. A single X in Categories 1 or 2 will result in test failure. A total of five (5) or more X's in the remaining categories (3-8) will result in test failure. There is a two week waiting period before an applicant is eligible to be re-tested after a road test rejection. This document is valid for 60 days from the date the skills test is passed. This document must be presented to the Department of Motor Vehicles for you to obtain your license.

ADDITIONAL COMMENTS (If required)

SIGNED (Inspector) X	BADGE NO.	DATE SIGNED
DISTRIBUTION: White-Branch Office Canary-Applicant		

COMMERCIAL PRE-TRIP EVALUATION REPORT
R-297 REV. 3-94

STATE OF CONNECTICUT
DEPARTMENT OF MOTOR VEHICLES
BRANCH OPERATIONS DIVISION

NAME OF APPLICANT (Last) (First) (M.I.)		TEST RESULT <input type="checkbox"/> PASS <input type="checkbox"/> FAIL	DATE OF BIRTH
TIME (Beginning)	TIME (Ending)	TEST <input type="checkbox"/> CLASS 1 <input type="checkbox"/> CLASS 1A <input type="checkbox"/> CLASS 1B <input type="checkbox"/> CLASS 2	
		TRAINING <input type="checkbox"/> COMMERCIAL <input type="checkbox"/> EMPLOYER <input type="checkbox"/> OTHER	
CATEGORY	ITEM	TOTAL X's	MANEUVER SCORE (✓ OR X)
Category 1 CLASS 1 CLASS 1A (UNCOUPLING & COUPLING)	UNCOUPLING UNITS GENERAL	<input type="checkbox"/> SET BRAKES/CHOCK BLOCKS <input type="checkbox"/> CHECK FOR SOLID GROUND <input type="checkbox"/> LOWER LANDING WHEELS/SUPPORTS	
	UNCOUPLING UNITS 5TH WHEEL	<input type="checkbox"/> RELEASE 5TH WHEEL COUPLER <input type="checkbox"/> RELEASE TRAILER BRAKES <input type="checkbox"/> PULL AHEAD UNTIL 5TH WHEEL CLEARS APRON <input type="checkbox"/> SET PARKING BRAKE <input type="checkbox"/> DISCONNECT & SECURE AIR/ELECTRIC LINE <input type="checkbox"/> PULL FORWARD APPROXIMATELY 15 FEET	
	UNCOUPLING UNITS PINTLE HOOK	<input type="checkbox"/> UNHOOK & SECURE AIR LINES <input type="checkbox"/> RELEASE PINTLE HOOK, RAISE EYE/CLEAR HOOK <input type="checkbox"/> UNHOOK ELECTRIC LINE & SAFETY CHAIN(S) <input type="checkbox"/> PULL FORWARD APPROXIMATELY 15 FEET	
	COUPLING UNITS 5TH WHEEL	<input type="checkbox"/> BACK & ALIGN 5TH WHEEL JAWS WITH KING PIN <input type="checkbox"/> CHECK IF AIR RELEASING FROM QUICK RELEASE VALVE <input type="checkbox"/> BACK UNTIL 5TH WHEEL TOUCHES APRON WITHOUT FLATTENING <input type="checkbox"/> REAPPLY TRAILER BRAKES <input type="checkbox"/> SECURE TRACTOR <input type="checkbox"/> BACK UNTIL 5TH WHEEL COUPLER ENGAGES & LOCKS <input type="checkbox"/> CHECK IF 5TH WHEEL COUPLER IS OPEN & HEIGHT IS CORRECT <input type="checkbox"/> CHECK COUPLER <input type="checkbox"/> CONNECT AIR/ELECTRIC LINE(S) <input type="checkbox"/> RAISE LANDING GEAR/SUPPORTS-SECURE IN LOW RANGE	
	COUPLING UNITS PINTLE HOOK	<input type="checkbox"/> BACK SLOWLY-TRUCK HOOK IN LINE WITH TRAILER EYE <input type="checkbox"/> STOP WITH EYE OVER HOOK <input type="checkbox"/> LOWER EYE-SECURE - HOOK <input type="checkbox"/> RAISE LANDING WHEELS OR REMOVE SUPPORTS <input type="checkbox"/> HOOK AIR LINE(S) IF APPLICABLE <input type="checkbox"/> HOOK ELECTRIC LINE(S) & SAFETY CHAIN(S) <input type="checkbox"/> REMOVE CHOCK BLOCKS	
Category 2 CLASS 1B CLASS 2 (PRE-TRIP)	EMERGENCY EQUIPMENT	<input type="checkbox"/> FIRE EXTINGUISHER <input type="checkbox"/> WARNING DEVICES <input type="checkbox"/> ELECTRICAL FUSES (IF APPLICABLE)	
	BRAKE SYSTEM-TYPE	<input checked="" type="checkbox"/> VACUUM <input type="checkbox"/> ELECTRIC <input type="checkbox"/> AIR <input type="checkbox"/> RETARDER <input type="checkbox"/> HYDRAULIC, VACUUM ASSIST HYDRAULIC	
	BRAKE SYSTEM - CHECK	<input type="checkbox"/> BRAKE FAILURE WARNING <input type="checkbox"/> LOW AIR WARNING	
	IN-CAB*	<input type="checkbox"/> SET PARKING BRAKE <input type="checkbox"/> TEST BRAKES (SERVICE) <input type="checkbox"/> TEST BRAKES (PARKING) <input type="checkbox"/> CHECK TRACTOR/TRAILER COUPLING <input type="checkbox"/> APPLY PARKING BRAKE, CHECK FOR ENGINE NOISE	
	IN-CAB	<input type="checkbox"/> ADJUST SEAT & MIRRORS <input type="checkbox"/> START ENGINE <input type="checkbox"/> CHECK ALL GAUGES <input type="checkbox"/> CHECK HORN(S) <input type="checkbox"/> CHECK WINDSHIELD WIPER(S) <input type="checkbox"/> TEST STEERING (WHEEL LASH) <input type="checkbox"/> CHECK ALL GLASS <input type="checkbox"/> TEST CLUTCH <input type="checkbox"/> TEST TRANSMISSION <input type="checkbox"/> TURN OFF ENGINE, TRANSMISSION PLACED IN LOWEST FORWARD GEAR	
	CIRCLE CHECK LEFT SIDE	<input type="checkbox"/> HEADLIGHTS (HIGH) <input type="checkbox"/> WHEELS <input type="checkbox"/> WHEELS <input type="checkbox"/> LEFT FRONT TURN SIGNAL <input type="checkbox"/> LUGS <input type="checkbox"/> LUGS <input type="checkbox"/> IDENTIFICATION LIGHTS <input type="checkbox"/> TIRES <input type="checkbox"/> TIRES <input type="checkbox"/> STEERING LINKAGE <input type="checkbox"/> REFLECTORS <input type="checkbox"/> LEFT REAR TURN SIGNAL	
	CIRCLE CHECK RIGHT SIDE	<input type="checkbox"/> HEADLIGHTS (LOW) <input type="checkbox"/> REFLECTORS <input type="checkbox"/> REAR LIGHTS <input type="checkbox"/> RIGHT FRONT TURN SIGNAL <input type="checkbox"/> WHEELS <input type="checkbox"/> FLAPS (IF REQUIRED) <input type="checkbox"/> WHEELS <input type="checkbox"/> LUGS <input type="checkbox"/> REAR DOORS <input type="checkbox"/> LUGS <input type="checkbox"/> TIRES <input type="checkbox"/> TRAILER ASSEMBLY <input type="checkbox"/> TIRES <input type="checkbox"/> RIGHT REAR TURN SIGNAL	
PLACEMENT OF EQUIPMENT ON VEHICLE	<input type="checkbox"/> 5TH WHEEL/JAWS RELEASE LEVER <input type="checkbox"/> FUEL TANK(S) <input type="checkbox"/> TRAILER LANDING GEAR <input type="checkbox"/> AIR LINES TO TRAILER <input type="checkbox"/> BATTERY(IES) <input type="checkbox"/> AIR TANK(S) <input type="checkbox"/> ELECTRIC LINE(S) TO TRAILER <input type="checkbox"/> SUSPENSION SYSTEM COMPONENTS <input type="checkbox"/> EXHAUST SYSTEM <input type="checkbox"/> SPARE TIRES & CARRIERS <input type="checkbox"/> AIR & FLUID LEAKS		

The scoring system is as follows: check (✓) means satisfactory. A single x in Category 1 or the following sections in Category 2 (Emergency Equipment, Brake System Check, In-Cab*) will result in test failure. A total of 6 or more x's in the remaining sections will result in test failure. There is a two week waiting period before an applicant is eligible to be re-tested. This document is valid for 60 days from the date the skills test is passed. This document must be presented to the Department of Motor Vehicles for you to obtain your license.

ADDITIONAL COMMENTS

SIGNATURE OF INSPECTOR

X

BADGE NUMBER

DATE SIGNED

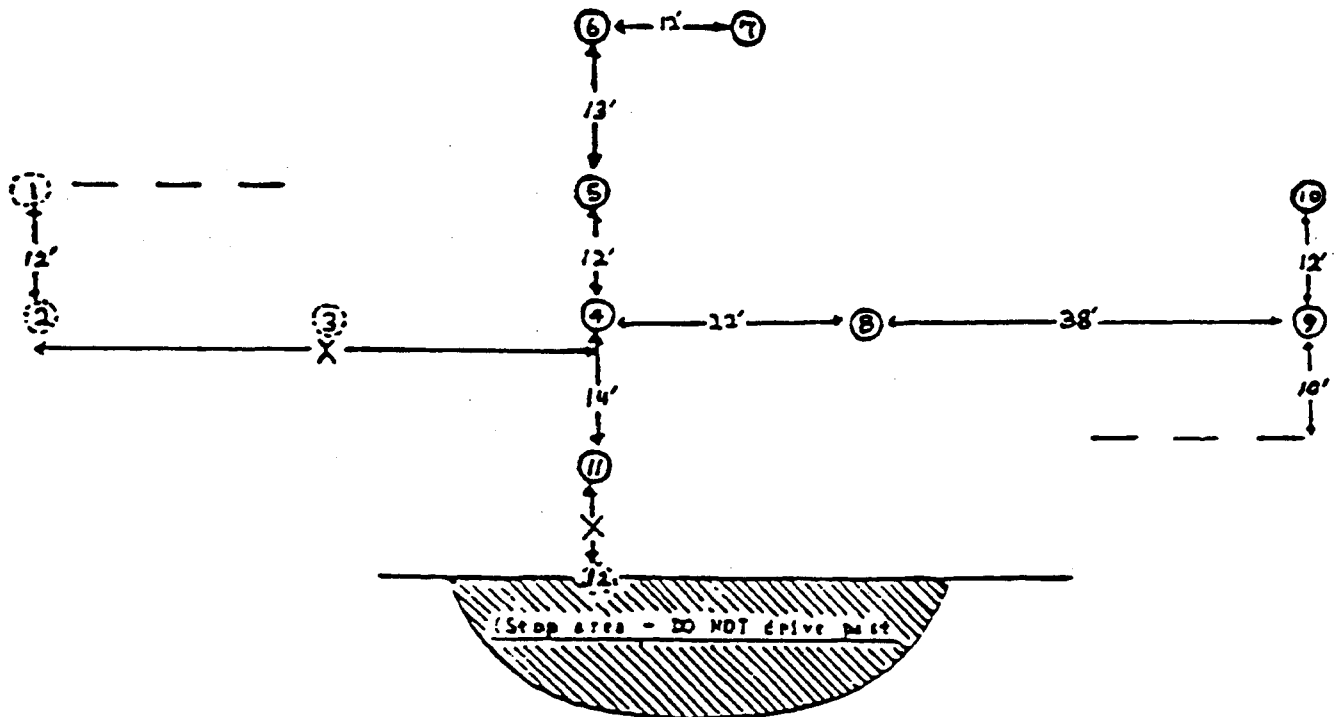
DISTRIBUTION: White - Branch Office Canary - Applicant

Detail of the Basic Control (Static) Test

The following pages discuss **Part 2: Basic Control (Static) Test** for all commercial motor vehicles.

BASIC CONTROL (STATIC) TEST COURSE

Diagram with Course Measurements



KEY

Adjusted flag

Stationary flag

Lane width

"Parked vehicle", "Building",
"Dock area", etc.

Class "A" vehicle

Class "B" vehicle

Adjustable feet



Basic Control (Static) Test Course

The following formula will be used to determine the area allocated for the parallel park maneuver (the distance between flags #2 and #4).

The vehicle's "over-hang" will be measured, that being the distance between the center of the rear-most axle and the rear-most extension of the truck body. Flags #1 and #2 will be set according to the allocated distances (area on diagram of course marked by "X"). Then flag #12 will be an equal distance to flag #6 as flag #2 is to flag #4. Flag #3 must be centered between flags #2 and #4.

- Class B, single axle vehicles with an over-hang:
 - of seven (7) feet or less, shall be allowed the length of the unit plus fifteen (15) feet.
 - in excess of seven (7) feet, shall be allowed the length of the unit plus twenty (20) feet.
- Class B, dual (or more) rear axles shall be allowed the length of the unit plus twenty (20) feet.
- Class A, truck/trailer or tractor/semi-trailer combination with a:
 - trailer under forty feet and a single screw tractor will be allowed the length of the unit plus twenty-five (25) feet.
 - trailer under forty feet and a twin screw tractor will be allowed the length of the unit plus thirty (30) feet.
 - trailer forty feet and over and a single screw tractor will be allowed the length of the unit plus thirty (30) feet.
 - trailer forty feet and over and a twin screw tractor will be allowed the length of the unit plus thirty-five (35) feet.

Basic Control (Static) Test Requirements

- Parallel parking to the curb (see diagram).
- Forward and backward through the alley (see diagram).
- Backing into alley dock - Jack-knife. The tractor will be parked at a 30 to 90 degree angle to the trailer (see diagram).

Notes and Limitations

- Once the test has begun the applicant may not leave the vehicle.
- All backing maneuvers are to be performed with the use of the side mirrors.
- The rear window is not to be used.
- The backing maneuver(s) for trucks and combinations of vehicles will be conducted using simulated alleys and loading docks. All trucks shall be directed to back up close enough to the dock so that the rear of the vehicle is within twenty-four inches (24") and square.
- An "attempt" is defined as "The act of putting the vehicle into reverse gear to perform a maneuver". An attempt starts when the applicant puts the transmission into reverse and ends when applicant shifts out of reverse.

Figure 1: Parallel Parking at the Curb

The applicant will be required to park and center the vehicle within the rectangular area formed by imaginary lines between flags #1 through #5 without crossing any lines or touching any flags. The overhang of the vehicle may encroach the line between flags #2 and #4. Three attempts will be allowed.

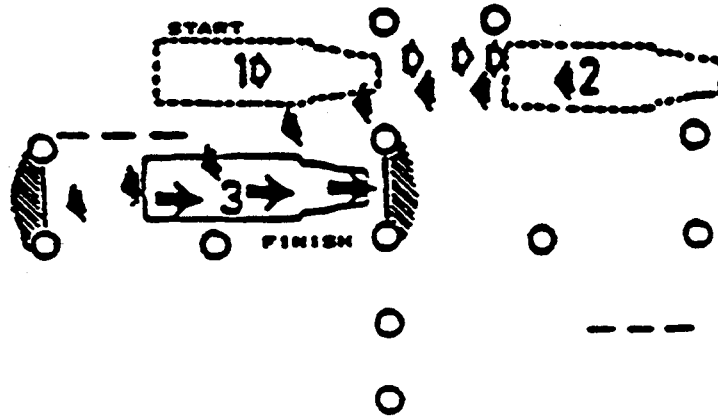


Figure 2: Forward and Backward thru Alley

The applicant will be required to operate the vehicle forward, in a straight line, through an alley, and come to a complete stop with the front bumper no more than twenty-four inches (24") from the course flags, #9 and #10 then back through the alley in a straight line and make a complete stop with the rear-most part of the vehicle no more than twenty-four inches (24") from the course flags, #1 and #2 without crossing any course lines or touching flags. Three attempts will be allowed.

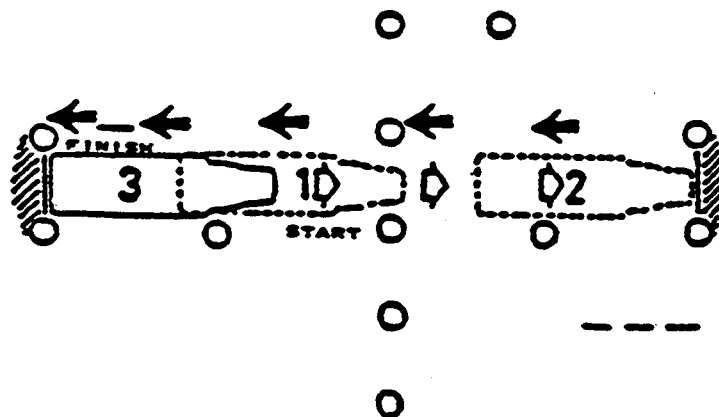


Figure 3: Backing into Alley Dock - Jack-Knife (Class A)

The applicant will be required to back into the alley and stop the trailer in a square-position with the rear-most part of the vehicle no more than twenty-four inches (24") from the dock represented by the imaginary line between flags #6 and #7 without crossing any lines or touching flags. The tractor will be parked at a 30 to 90 degree angle to the trailer. Three attempts will be allowed. The applicant will not be permitted to pull forward beyond a line designated by the position of flag #12.

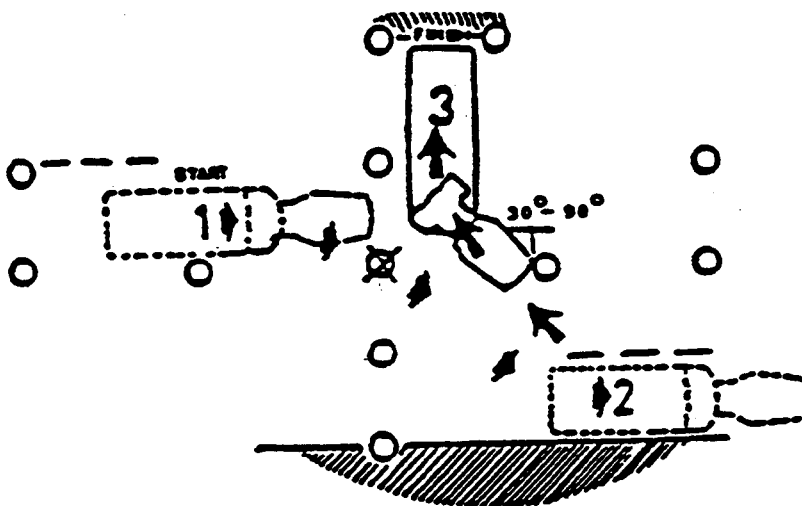
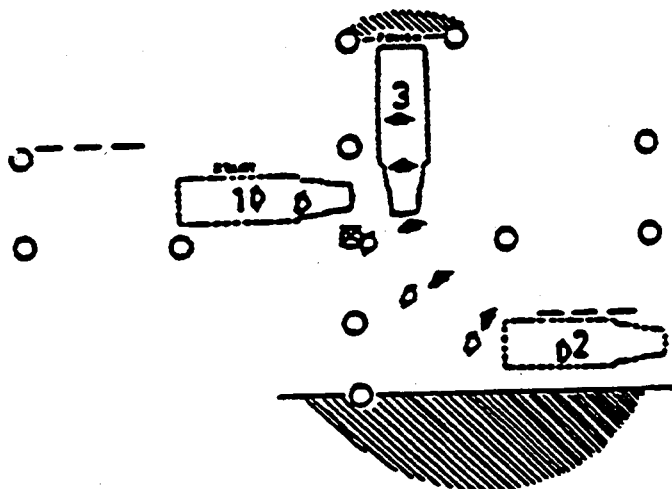


Figure 4: Backing into Alley Dock - Jack-Knife (Class B)

The applicant will be required to back into the alley and stop the truck in a square-position with the rear-most part of the vehicle no more than twenty-four inches (24") from the dock without crossing any lines or touching flags. Three attempts will be allowed. The applicant will not be permitted to pull forward beyond a line designated by the position of flag #12.



Notes

From the start to the finish of the "Backing into Alley Dock" maneuver, the applicant will be allowed to leave the cab of the vehicle one time to check the vehicle's position.

However, leaving the cab of the vehicle, will conclude the attempt the applicant is working on. If any unsafe practices are committed by the applicant i.e., failure to set parking brake, leaving running vehicle in gear, etc., this shall be deemed automatic failure.

An evaluation report will be made out by the examiner at the end of the road test. You will be given a copy of the evaluation report which includes your test score. You must obtain your CDL within 60 days from any full-service Motor Vehicle office or you will be required to take the skills test over.

Some Additional Causes for Test Failure

- Inability to perform pre-trip inspection check satisfactorily due to lack of knowledge or experience. The pre-trip inspection check includes emergency equipment check, in-cab check, and right and left circle checks
- Inability to satisfactorily complete any maneuver in its allotted time
- Inability to complete a maneuver in the number of attempts allowed. Parallel parking, forward and backward through the alley, and backing into the alley dock (jack-knife). A maximum of three (3) attempts is allowed for each maneuver
- Inability to perform a satisfactory road test
- Unsecured vehicle, which is left unattended
- The vehicle crossing any line or driving over any flag. The exception is in parallel parking maneuver where the overhang may be backed over the line created by flags #2, #3, and #4.

Some Causes for Test Failure (Class A) Uncoupling of Units

- Failure to set trailer brakes (or use of chock blocks where there is no independent trailer braking system) before leaving the cab to lower the landing wheels
- Failure to lower landing wheels or supports before unlocking fifth (5th) wheel
- Failure to shut off air lines and set tractor parking brake before disconnecting airlines
- Failure to disconnect air lines and light cord before final separation of units.

Some Causes for Test Failure (Class A) Coupling of Units

- Flattened fifth (5th) wheel when coupling units
- Failure to set tractor parking brake before getting out of cab to connect air lines and electric lines
- Failure to set trailer brakes (or use chock blocks when there is no independent trailer braking system) before backing under the trailer to engage fifth (5th) wheel coupler
- Failure to check coupling by pulling forward with trailer brakes locked or wheels chocked
- Failure to raise landing wheels or supports before moving.

Evaluation Criteria

- The operator will be allowed three attempts per maneuver (time permitting)
- The vehicle must remain within the boundaries of the measured course and not touch any marker
- Each driver must successfully complete the following:
 - Backing to the right
 - Stopping at a line
 - Backing to a line
 - Right turn
 - Backing to the left
 - Simulated loading of passengers (Passenger Endorsements)
 - Simulated railroad crossing (Passenger and/or Hazmat Endorsements).

License Type

A "J" weight restriction will be noted on a class C license if the vehicle used during the skills test had a GVWR of under 18,001 lbs.

An "L" (air brake) restriction will be noted on the license if the vehicle used during the skills test was not equipped with air brakes.

1.3 OTHER SAFETY ACT RULES

One License

You cannot have more than one license to operate commercial vehicles. If you break this rule, a court may fine you up to \$5,000 or put you in jail. Keep your Connecticut license and return any others to the licensing state.

All states are connected to one computerized system to share information about CDL drivers. The Department of Motor Vehicles will check with the computerized system to ensure that drivers do not obtain more than one CDL.

Previous Employers

You must give your employer information on all driving jobs you have held for the past 10 years. You must do this when you apply for a commercial driving job.

Violation Notification

You must notify your employer within 30 days of a conviction or forfeiture of bond for any traffic violation (except parking). This is true no matter what type of vehicle you were driving, commercial or passenger.

You must notify the Connecticut Department of Motor Vehicles, Driver Services Division, within 30 days if you are convicted in any other state of any traffic violation (except parking). This is true no matter what type of vehicle you were driving.

Notify the Connecticut Department of Motor Vehicles in writing thru the mail. Mail your notification to:

**Department of Motor Vehicles
Room 327, Driver Services Division
60 State Street
Wethersfield, CT 06161-5018**

If you are Disqualified

You must notify your employer if your license is suspended, revoked, canceled or if you are disqualified from driving.

No one can drive a commercial motor vehicle without a CDL. A court may fine you up to \$5,000 or put you in jail for breaking this rule.

Your employer may not let you drive a commercial motor vehicle if you have more than one license or if your CDL is suspended or revoked. A court may fine the employer up to \$5,000 or put the employer in jail for breaking this rule.

SECTION 2: DRIVING SAFELY

This Section Covers

Vehicle Inspection
7-Step Inspection Method
Vehicle Control
Shifting Gears
Seeing
Communicating
Speed & Space Management
Night Driving
Weather Conditions
Railroad Crossings
Mountain Driving
Emergencies
Staying Alert
Hazardous Materials Rules for All Drivers

Introduction

This section contains general knowledge and safe driving practices which **all** commercial drivers should know. You must take a test on this information to get a commercial driver's license.

This section does **not** contain information on air brakes, combination vehicles (tractor-semitrailer, doubles, triples, truck pulling heavy trailer), buses or tank vehicles. You must read other sections to get such information if it applies to the type of vehicle you intend to drive.

This section does have some basic information on hazardous materials. It is in this section so you will know if you require a hazardous materials endorsement. You will find the information you need to get a hazardous materials endorsement in a separate Hazardous Materials Section booklet. The Hazardous Materials Section booklet can be obtained at any DMV branch office or by calling 1-800-842-8222.

2.1 VEHICLE INSPECTION

Why Inspect?

Safety. Safety is the most important and obvious reason. Inspecting your vehicle helps you to know your vehicle is safe.

Legal Requirements. Federal and State laws require inspection by the driver. Federal and State inspectors also inspect commercial vehicles. An unsafe vehicle can be put out-of-service until the out-of-service defect(s) are repaired.

Types of Vehicle Inspections

Pre-Trip Inspection. A pre-trip inspection is performed before each trip to find problems that could contribute to an accident or breakdown. Also during the pre-trip inspection, the driver will confirm that any previously noted defects have been repaired.

During a Trip. For safety you should:

- Watch the gauges for signs of trouble
- Use your senses to check for problems (look, listen, smell, feel)
- Check critical items when you stop:
 - Tires, wheels and rims
 - Brakes
 - Lights and reflectors
 - Brake and electrical connections to trailer
 - Trailer coupling devices
 - Cargo securement devices.

Post-Trip Inspection and Report. A post-trip inspection report must be completed at the end of the trip, day, or tour of duty on each vehicle you operated. The post-trip inspection report includes filling out a **Vehicle Condition Report** listing any problems you find. The post-trip inspection report helps the vehicle owner know when to fix something.

What to Look For

Tire Problems. It is dangerous to drive with bad tires. Look for problems such as:

- Too much or too little air pressure
- Bad wear. You need at least 4/32 inch tread in every major groove on the front tires. You need 2/32 inch on other tires. No fabric should show through the tread or sidewalls
- Nails or other objects imbedded in the tire
- Cuts or other damage
- Tread separation
- Dual tires that come in contact with each other or parts of the vehicle
- Mismatched sizes
- Radial and bias-ply tires used together on the same axle
- Cut or cracked valve stems
- Re-grooved, recapped, or retreaded tires on the front wheels of a bus because they are prohibited.

Wheel and Rim Problems.

- Bad wheels or rims could cause an accident
- A damaged rim can cause the tire to lose pressure or come off
- Shiny metal around wheel nuts may mean the nuts are loose - check tightness
- Leaking wheel seals can allow fluids to contaminate the brakes
- After a tire has been changed, stop a short while later and recheck tightness of nuts
- Missing clamps, spacers, studs or lugs mean danger
- Mismatched, bent or cracked lock rings are dangerous
- Wheels or rims that have had welding repairs are not safe.

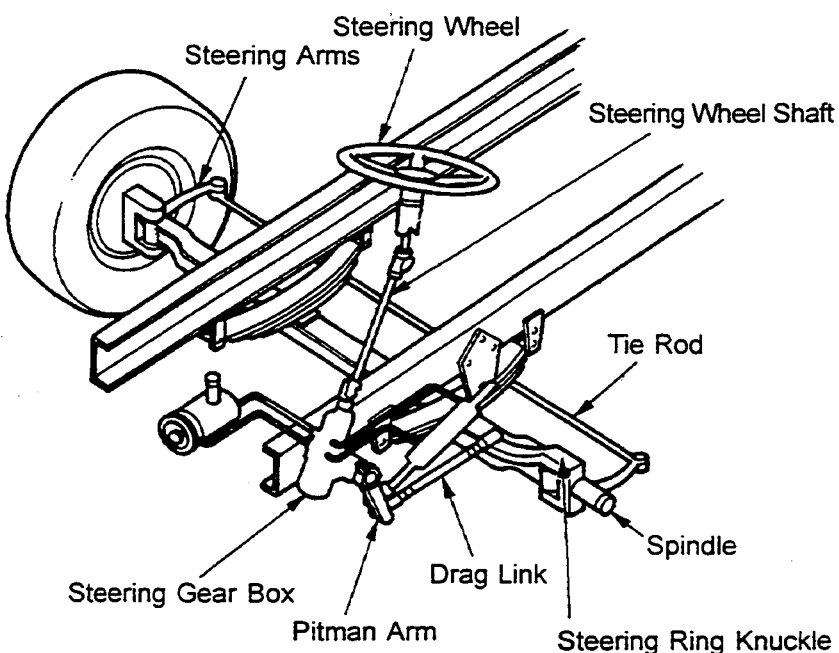
Bad Brake Drums or Shoes.

- Cracked drums
- Brake drums, shoes or pads with oil, grease, or brake fluid on them
- Shoes worn dangerously thin, missing or broken.

Steering System Defects (See Figure 5).

- Missing nuts, bolts, cotter pins, or other parts
- Bent, loose, or broken parts, such as steering column, steering gear box or tie rods
- If power steering equipped, check fluid level and check for leaks in hoses and pumps
- Steering wheel play of more than 10 degrees (approximately 2 inches movement at the rim of a 20-inch steering wheel) can make it hard to steer.

Figure 5: Examples of Steering System Key Parts



Suspension System Defects (See Figure 6 and Figure 7). The suspension system holds up the vehicle and its load. It keeps the axles in place. Therefore, broken suspension parts can be extremely dangerous. You should check for:

- Spring hangers that allow movement of the axle from the proper position
- Cracked or broken spring hangers
- Leaking shock absorbers
- Torque rod or arm, U-bolts, spring hangers or other axle positioning parts that are cracked, damaged, or missing
- Air suspension systems that are damaged and/or leaking
- Any loose, cracked, broken or missing frame members.

Figure 6: Key Suspension Parts

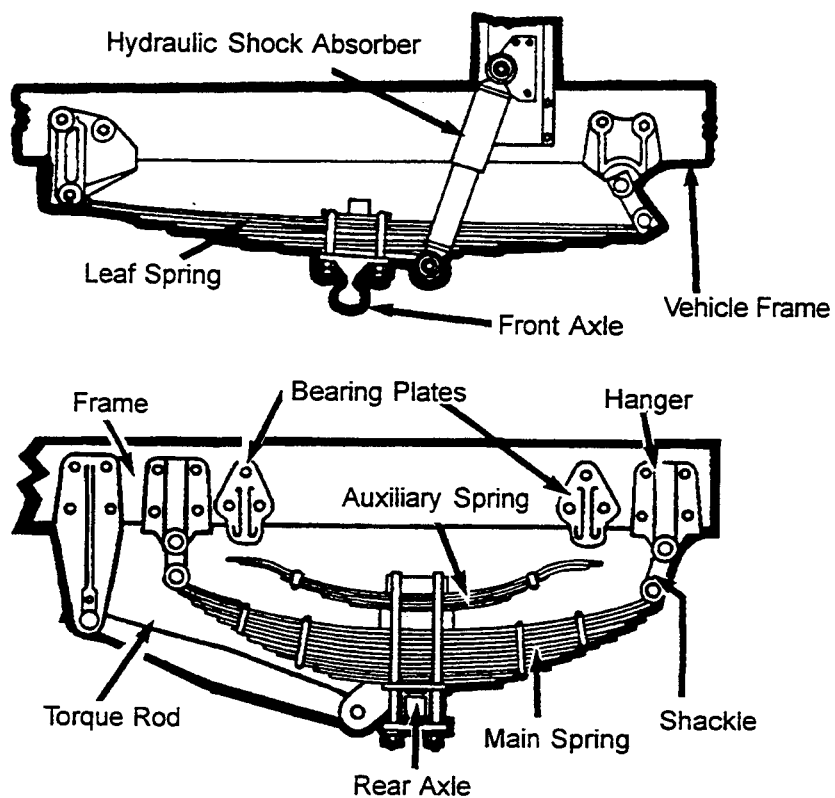
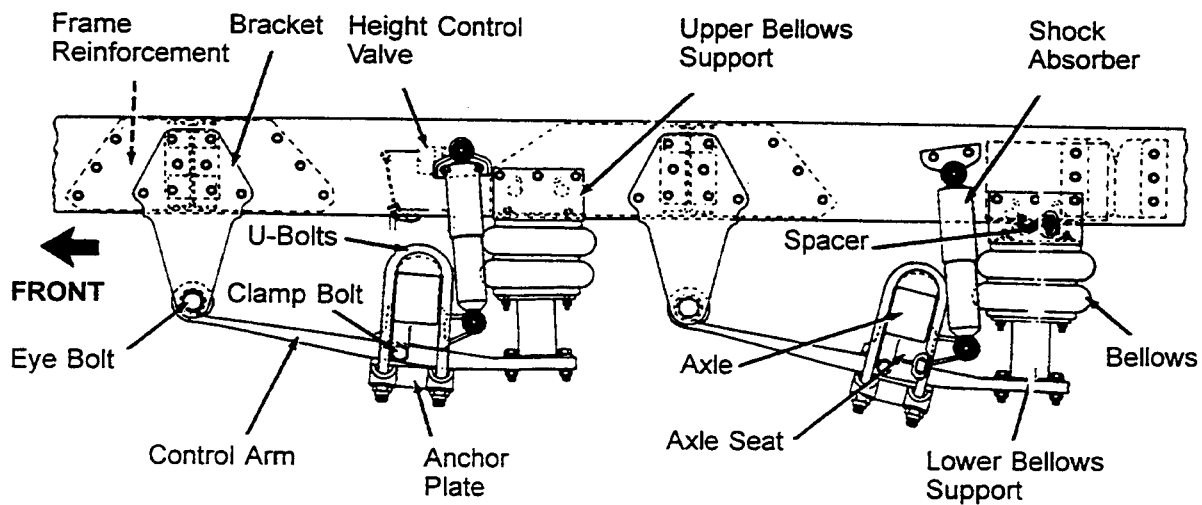
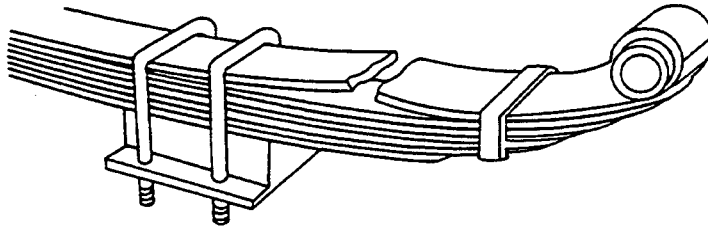


Figure 7: Air Suspension Parts



**Figure 8: Safety
Defect - Broken Leaf in
Leaf Spring**



Spring Defects (See Figure 8).

- Missing or broken leaves in any leaf spring. If one fourth or more are missing, the vehicle will be put out-of- service
- Broken leaves in a multi-leaf spring or leaves that have shifted so they might hit a tire or other part.

Exhaust System Defects. A broken exhaust system can let poison fumes into the vehicle or sleeper berth. You should check for:

- Loose, broken, or missing exhaust pipes, mufflers, tailpipes or vertical stacks
- Loose, broken, or missing mounting brackets, clamps, bolts or nuts
- Exhaust system parts rubbing against fuel system parts, tires or other moving parts of vehicle
- Exhaust system parts that are leaking
- Holes in the cab adjacent to the exhaust system which could allow fumes to enter the driver's compartment.

Emergency Equipment. Vehicles must be equipped with emergency equipment:

- Fire extinguisher(s)
- Spare electrical fuses (unless equipped with circuit breakers)
- Warning devices for disabled vehicles (three reflective warning triangles)
- First aid equipment (if required)
- Chock blocks (if required).

Cargo (Trucks). You must inspect for cargo overloading, correct balance and securement of load before each trip. If tie down straps are used, confirm that they are properly placed. If the cargo contains hazardous materials, you must inspect for proper papers and placarding.

Test Your Knowledge

1. What is the most important reason for doing vehicle inspections?
2. What things should you check during a trip?
3. Name some key steering system parts.
4. Name some suspension system defects.
5. What three kinds of emergency equipment must you have?
6. What is the minimum tread depth for front tires?
7. For other tires?

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.1 VEHICLE INSPECTION**.

2.2 7-STEP INSPECTION METHOD

Method of Inspection

You should do a pre-trip inspection the same way each time so you will learn all the steps and be less likely to forget something. The following **7-Step Inspection Method** should be a useful guide. Memory aids are shown in Figure 9, Figure 10 and Figure 11. They may help you remember important things to inspect. Some of the items shown in the figures and described in the text may actually be in a different position or on the other side of the truck that you use for the test. Inspect the vehicle in accordance to where the items are located.

When you take your test you must explain to the Inspector what parts of the vehicle you are inspecting. Describe the possible defects you are looking for. It will help you pass the test if you practice this with a friend beforehand. You will be marked down for important items that you fail to inspect.

Step 1: Vehicle Overview, Pre-Trip Inspection Begins Here

Approaching the Vehicle. Notice the general condition. Look for damage or vehicle leaning to one side. Look under the vehicle for fresh oil, coolant, grease or fuel leaks. Check the area around the vehicle for hazards to vehicle movement (people, other vehicles, objects, low hanging wires or limbs, etc.).

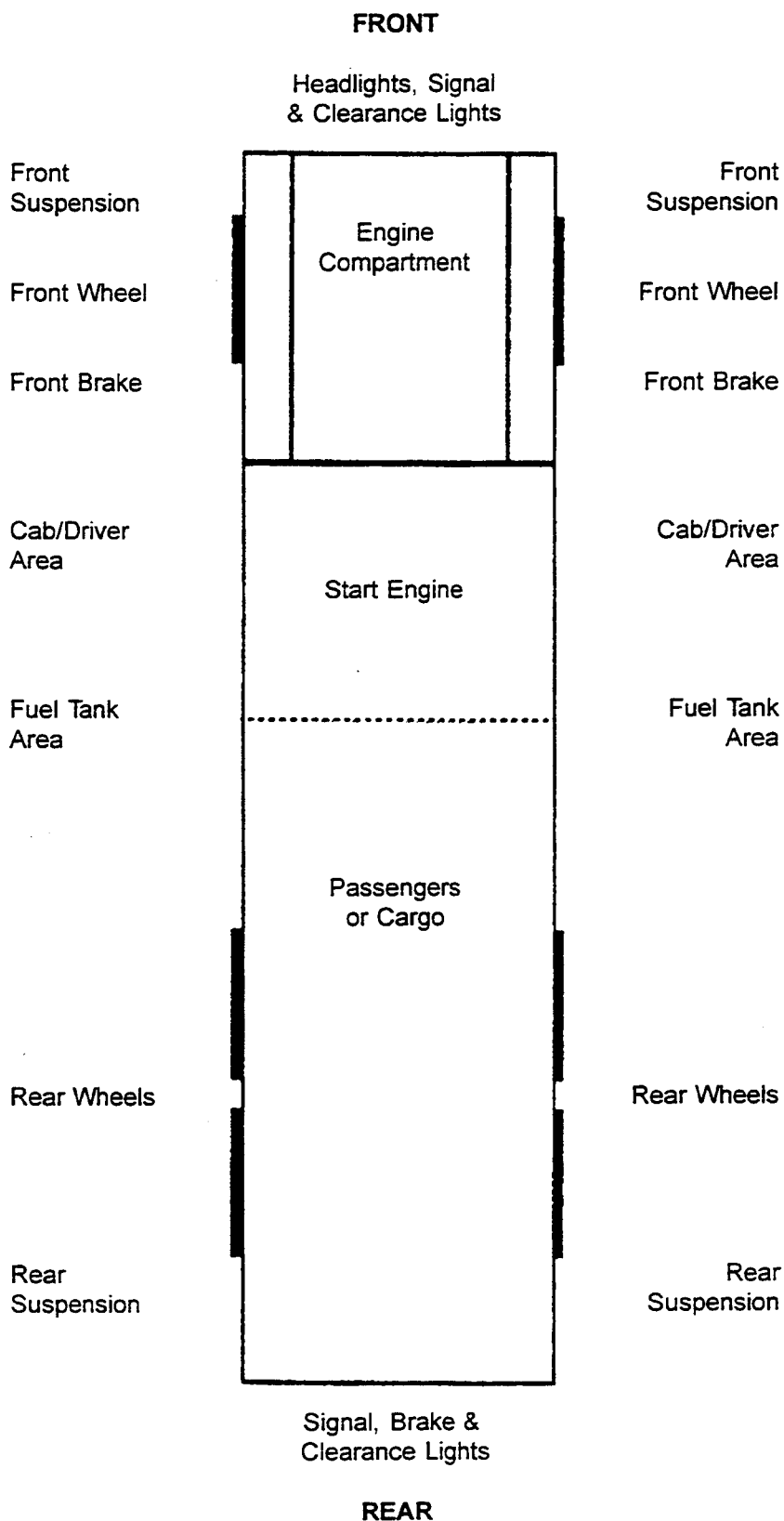
Review Last Vehicle Inspection Report. Drivers will have to make a vehicle inspection report in writing each day. The vehicle owner should repair items in the report that affect safety. You should look at the last report for previous problems, if any. Inspect the vehicle to find out if problems were fixed.

**Figure 9: Straight Truck
/ School Bus (front
engine)**

**Vehicle Inspection Guide
(Key Locations To Inspect)**

SAFETY NOTE

Always put the vehicle key
in your pocket - or
someone might move the
vehicle while you are
checking underneath it.

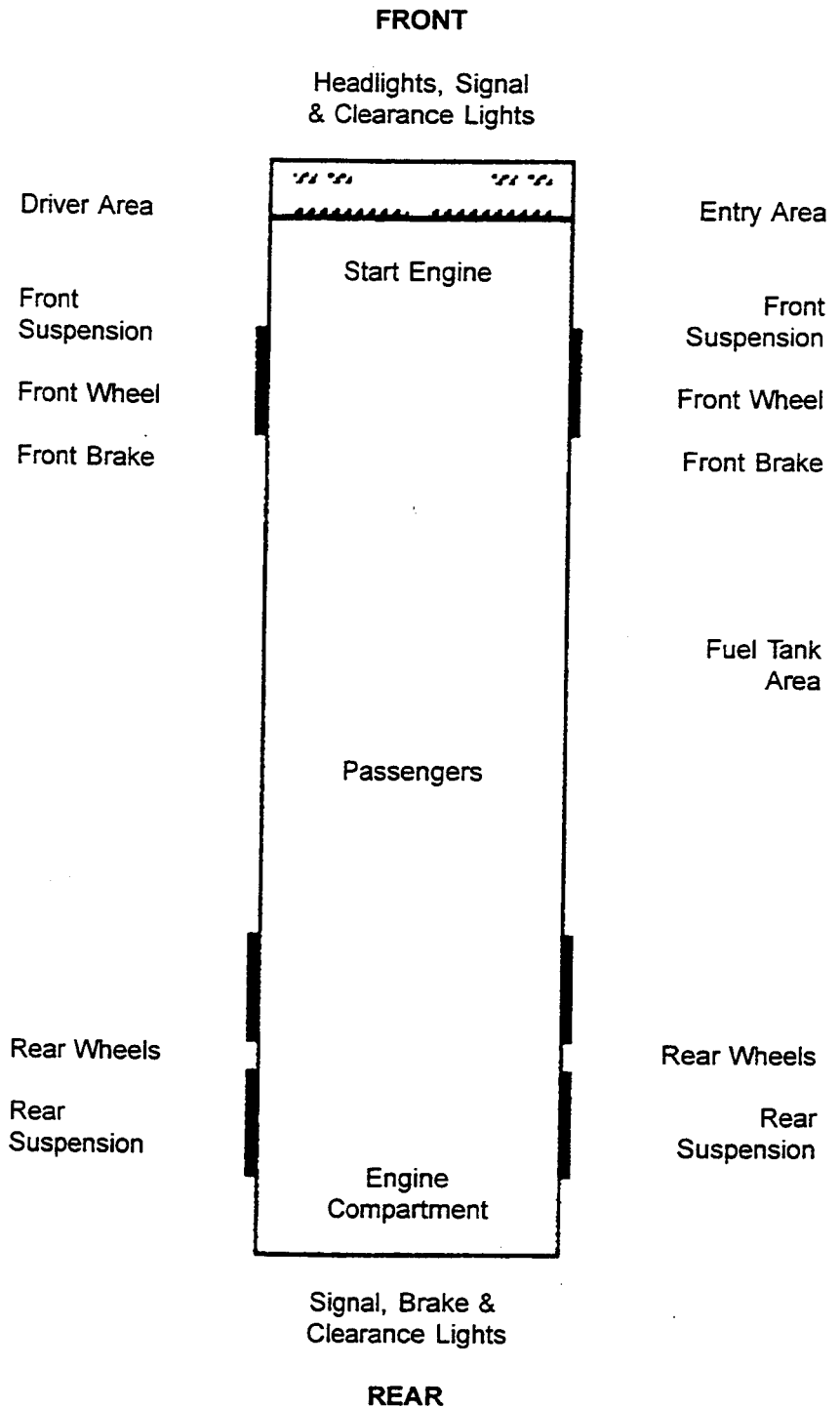


**Figure 10: Coach /
Transit Bus (rear
engine)**

**Vehicle Inspection Guide
(Key Locations To Inspect)**

SAFETY NOTE

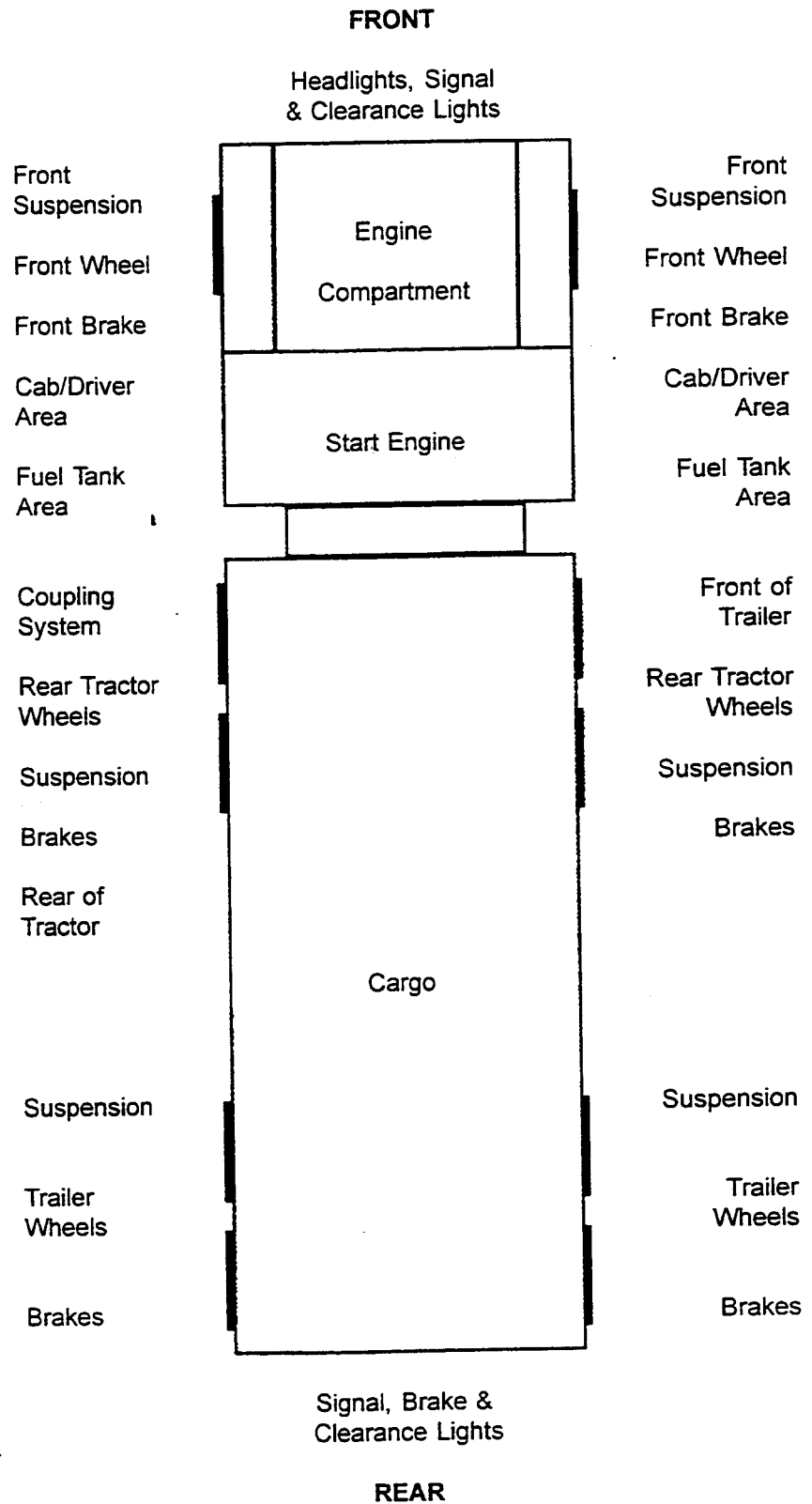
Always put the vehicle key
in your pocket - or
someone might move the
vehicle while you are
checking underneath it.



**Figure 11: Tractor
Trailer**

**Vehicle Inspection Guide
(Key Locations To Inspect)**

SAFETY NOTE
If you are parked on a street, walk around so you are facing the oncoming traffic. Pay attention so you don't get run over.



Step 2: Emergency Equipment

Check Emergency Equipment.

- Check for safety equipment:
 - Spare electrical fuses (unless vehicle has circuit breakers)
 - Three red reflective triangles (flares are not carried if flammable material is being hauled)
 - Properly charged and rated fire extinguisher
- Check for optional items such as:
 - Tire chains (where winter conditions require them)
 - Tire changing equipment
 - List of emergency phone numbers
 - Accident reporting kit (packet)
 - First Aid kit
 - Body fluid clean up kit (if required).

Step 3: Check Engine Compartment

Check that the Parking Brakes are on and/or Wheels Chocked.

You may have to raise the hood, tilt the cab (secure loose items so they don't fall and break something), or open the engine compartment door. Check the following:

- Engine oil level
- Coolant level in radiator; condition of hoses
- Power steering fluid level; hose condition (if so equipped)
- Windshield washer fluid level
- Battery fluid level, connections and tie-downs (battery may be located elsewhere)
- Automatic transmission fluid level (may require engine to be running)
- Check belts for tightness and excessive wear (alternator, water pump, air compressor) - learn how much "give" the belts should have when adjusted right, and check each one
- Leaks in the engine compartment (fuel, coolant, oil, power steering fluid, hydraulic fluid, battery fluid)
- Cracked, worn electrical wiring insulation
- Lower and secure hood, cab, or engine compartment door.

Step 4: Start Engine and Inspect Inside Cab

Get In and Start Engine.

- Make sure parking brake is on
- Put gearshift in neutral (or "park" if the transmission has a park position)
- Turn the key to the "on" position and check the warning lights and buzzers (such as brakes, oil, coolant, charging circuit warning lights)
- Start engine and listen for unusual noises.

Look at the Gauges.

- Oil pressure should come up to normal within seconds after engine is started
- Ammeter and/or **voltmeter** should be in normal range(s)

- Coolant **temperature** should begin gradual rise to normal operating range
- Engine oil temperature should begin gradual rise to normal operating range
- Warning lights and buzzers should go out right away.

Check Mirrors and Windshield. Inspect mirrors and windshield for cracks, dirt, illegal stickers or other items which obstruct your vision. Clean and adjust as necessary.

Test for Hydraulic Leaks. If the vehicle has hydraulic brakes, pump the brake pedal three times, then apply pressure to the pedal and hold for five seconds. The pedal should not move. If the pedal does move, there may be a leak or other problem. Have it fixed before driving.

NOTE: If the vehicle has **AIR BRAKES**, do the checks described in Sections 5 and 6 of this manual.

Test Parking Brake.

- Stop the vehicle
- Put the parking brake on
- Gently pull against it in a low gear to test that the parking brake holds
- If parking brake doesn't hold vehicle, the brake is faulty; get the parking brake fixed.

Test Service Brake Stopping Action.

- Go about five miles-per-hour
- Push brake pedal firmly - "Pulling" to one side or the other can mean brake trouble
- Any unusual brake pedal "feel" or delayed stopping can mean trouble.

Check Condition of Controls. Check all of the following for looseness, sticking, damage, or improper setting:

- Steering wheel
- Clutch
- Accelerator ("gas pedal")
- Brake controls
 - Foot brake
 - Trailer brake (if vehicle has one)
 - Parking brake
 - Retarder controls (if vehicle has them)
- Transmission controls
- Interaxle differential lock (if vehicle has one)
- Horn(s)
- Windshield wiper/washer

- Lights
 - Headlights
 - Dimmer switch
 - Turn signal
 - 4-way hazard lights
 - Clearance, identification, marker light switch(es).

Turn Off Engine.

- Remove the ignition key
- Turn on the headlights (High-beams)
- Switch on the left turn-signal.

Step 5: Left Circle Check

Front.

- Headlights
- Clearance lights and reflectors
- Left-turn signal
- Condition of front axle
- Condition of steering system
 - No loose, worn, bent, damaged or missing parts
 - Must grab steering mechanism to test for looseness
- Condition of windshield
 - Check for damage and clean if dirty
 - Check windshield wiper arms for proper spring tension
 - Check wiper blades for damage, "stiff" rubber, and securement.

Left Front Side.

- Driver's door glass should be clean
- Door latches or locks work properly
- Left front wheel
 - Condition of wheel and rim - missing, bent or broken studs, clamps, lugs, any sign of misalignment
 - Condition of tires - properly inflated, valve stem and cap in place, no serious cuts, bulges, tread wear
 - Use wrench to test rust streaked lug nuts, indicating looseness
 - Hub oil level OK, no leaks
- Left front suspension
 - Condition of spring, spring hangers, shackles, U-bolts
 - Shock absorber condition
- Left front brake
 - Condition of brake drum
 - Condition of hoses.

Left Rear Side. Check all items as done on right side, plus:

- Left rear signal

- Battery (if not mounted in engine compartment)
- Battery box securely mounted to vehicle
- Box has secure cover
- Battery(s) secured against movement
- Battery(s) not broken or leaking
- Fluid in battery(s) at proper level (except maintenance-free type)
- Cell caps present and securely tightened (except maintenance-free type)
- Vents in cell caps free of foreign material (except maintenance-free type).

Step 6: Right Circle Check

Right Front Side.

- Go to the cab, dim the lights
- Switch on the right turn-signal
- Right front, check all items as done on left front
- Primary and safety cab locks engaged (if cab-over-engine design)
- Right fuel tank(s)
 - Securely mounted, not damaged or leaking
 - Fuel crossover line secure
 - Tank(s) contain enough fuel
 - Cap(s) on and secure
- Condition of visible parts
 - Engine - not leaking
 - Transmission - not leaking
 - Exhaust system - secure, not leaking, not touching wires, fuel or air lines
 - Frame and cross members - no bends, cracks
 - Air lines and electrical wiring - secured against snagging, rubbing, wearing
 - Spare tire carrier or rack not damaged (if so equipped)
 - Spare tire and/or wheel securely mounted in rack
 - Spare tire and wheel adequate (proper size, properly inflated)
- Cargo securement (trucks)
 - Cargo properly blocked, braced, tied, chained, etc.
 - Header board adequate, secure (if required)
 - Side boards, stakes strong enough, free of damage, properly set in place (if so equipped)
 - Canvas or tarp (if required) properly secured to prevent tearing, billowing or blocking mirrors
 - If oversize, all required signs must be safely and properly mounted and all required permits in driver's possession
 - Curbside cargo compartment doors securely closed, latched/locked, and required security seals in place.

Right Rear Side.

- Condition of wheels and rims - no missing, bent or broken spacers, studs, clamps, or lugs
- Condition of tires - properly inflated, valve stems and caps in place, no serious cuts, bulges, tread wear, tires not rubbing each other and nothing stuck between them
- Tires same type, e.g., not mixed radial and bias types
- Tires evenly matched (same sizes)
- Wheel bearing/seals not leaking
- Suspension
 - Condition of spring(s), spring hangers, shackles and U-bolts
 - Axle secure
 - Powered axle(s) not leaking lube (gear oil)
 - Condition of torque rod arms, bushings
 - Condition of shock absorber(s)
 - If retractable axle equipped, check condition of lift mechanism, if air powered, check for leaks.

Step 7: Rear Check**Check Rear of Vehicle.**

- Lights and reflectors
 - Rear clearance and identification lights clean, operating and proper color (red at rear)
 - Reflectors clean and proper color (red at rear)
 - Taillights clean, operating and proper color (red at rear)
 - Right rear turn-signal operating, and proper color (red, yellow, or amber at rear)
- License plate(s) present, clean and secured
- Splash guards present, not damaged, properly fastened, not dragging on ground or rubbing tires
- Cargo secure (trucks)
 - Cargo properly blocked, braced, tied, chained, etc.
 - Tailboards up and properly secured
 - End gates free of damage, properly secured in stake sockets
 - Canvas or tarp (if required) properly secured to prevent tearing, billowing which would block the rear view mirrors or cover the rear lights
 - If over-length, or over-width, make sure all signs and/or additional lights/flags are safely and properly mounted and all required permits are in driver's possession
 - Rear doors securely closed, latched/locked.

General.

- Walk around and inspect
- Clean all lights, reflectors and glass as you go along
- Brakes
 - Condition of brake drum(s)
 - Condition of hoses - look for any wear due to rubbing

- Lights and reflectors
 - Side-marker lights clean, operating and proper color (red at rear, others amber)
 - Side-marker reflectors clean and proper color (red at rear, others amber)
- All lights and reflectors
 - Check for cleanliness, proper color and the fact that they are operational.

SAFETY NOTE

If you find anything unsafe during the pre-trip inspection, get it fixed. Federal and State laws forbid operating an unsafe vehicle.

This Completes the Pre-Trip Inspection.

Test Your Knowledge

1. Name some items you should check on the front of your vehicle during the walk-around inspection.
2. What should wheel bearing seals be checked?
3. How many red reflective triangles should you carry?
4. How do you test hydraulic brakes for leaks?
5. Why put the starter switch key in your pocket during the pre-trip inspection?

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.2 7-STEP INSPECTION METHOD.**

Inspection During a Trip

Check Vehicle Operation Regularly. You should check:

- Instruments
- Air pressure gauge (if you have air brakes)
- Temperature gauges
- Pressure gauges
- Ammeter/voltmeter
- Mirrors
- Tires
- Cargo, cargo covers

Post-Trip Inspection & Report

If you see, hear, smell, or feel anything that might mean trouble, check it out.

Safety Inspection.

Drivers of trucks and truck tractors must inspect within the first 25 miles of a trip and every 150 miles or every 3 hours (whichever comes first) afterward.

Check these things:

- Cargo doors and/or cargo securement
- Tires - Enough air pressure; not overheated
- Brakes - not overheated (put back of hand near brake drums to test)
- Coupling devices.

You will have to make a written report each day on the condition of the vehicle(s) you drove. Report anything affecting safety or possibly leading to mechanical break-down.

The Vehicle Inspection Report tells the vehicle owner about problems that may need fixing. Keep a copy of your report in the vehicle for one day. That way the next driver can learn about any problems you have found.

2.3 BASIC CONTROL OF YOUR VEHICLE

To drive a vehicle safely, you must be able to control its speed and direction. Safe operation of a commercial vehicle requires skill in:

- Accelerating
- Steering
- Shifting gears
- Braking

Fasten your seatbelt when on the road. Apply the parking brake when you leave your vehicle.

Accelerating

Don't roll back when you start. You may hit someone behind you. Partly engage the clutch before you take your right foot off the brake. Put on the parking brake whenever necessary to keep from rolling back. Release the parking brake only when you have applied enough engine power to keep from rolling back. On a tractor-trailer equipped with a trailer brake hand valve, the hand valve can be applied to keep from rolling back.

Speed up smoothly and gradually so the vehicle does not jerk. Rough acceleration can cause mechanical damage. When pulling a trailer, rough acceleration can damage the coupling.

Speed up very gradually when traction is poor, as in rain or snow. If you use too much power, the drive wheels may spin. You could lose

control. If the drive wheels begin to spin, take your foot off the accelerator.

Steering

Hold the Wheel Right. Hold the steering wheel firmly with both hands. Your hands should be on the outside of the wheel on opposite sides (not on the spokes). If you hit a curb or a pothole (chuckhole), the wheel could pull away from your hands unless you have a firm hold.

Backing with a Trailer

Backing with a Trailer. When backing a car, straight truck or bus, you turn the top of the steering wheel toward the direction you want to go. When backing a trailer, you turn the wheel in the opposite direction. Once the trailer starts to turn, you must turn the wheel the other way to follow the trailer.

Whenever you back with a trailer, try to position your vehicle so you can back in a straight line. If you must back on a curved path, back to the driver's side so you can see.

Back Slowly. Backing slowly will allow you to make corrections before you get too far off course.

Use the Mirrors. The mirrors will help you see whether the trailer is drifting to one side or the other.

Correct Drift Immediately. As soon as you see the trailer getting off the proper path, turn the top of the steering wheel in the direction of the drift to correct the drift.

Pull Forward. When backing a trailer, make pull-ups to reposition your vehicle as needed.

Backing Safely

Backing is Always Dangerous. You cannot see everything behind your vehicle. Avoid backing whenever you can. When you park, try to park so you will be able to pull forward when you leave. When backing, here are a few simple safety rules:

- Look at your path
- Back slowly
- Back and turn toward the driver's side whenever possible
- Use a helper whenever possible
- Use your hazard lights

These rules are discussed below.

Look at Your Path. Look at your line of travel **before** you begin. Get out and walk around the vehicle. Check your clearance to the sides and overhead in and near the path your vehicle will take.

Back Slowly. Always back as slowly as possible. Use the lowest reverse gear. That way you can more easily correct any steering errors. You can stop quickly if necessary.

Back and Turn Toward the Driver's Side. Back to the driver's side so you can see better. Backing toward the right side is very

dangerous because you can't see as well. If you back and turn toward the driver's side, you can watch the rear of your vehicle by looking out the side window. Use driver-side backing - even if it means going around the block to put your vehicle in this position. The added safety is worth it.

Use a Helper. Use a helper when you can. There are blind spots you can't see. That's why a helper is important. The helper should stand near the back of your vehicle where you can see the helper. Before you begin backing, work out a set of hand signals that you both understand. Agree on a signal for "stop".

Test Your Knowledge

1. Why should you back toward the driver's side?
2. What is a pull-up?
3. If stopped on a hill, how do you start moving without rolling back?
4. When backing, why is it important to use a helper?
5. What's the most important hand signal that you and the helper should agree on?

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.3 BASIC CONTROL OF YOUR VEHICLE**.

2.4 SHIFTING GEARS

Correct shifting of gears is important. If you can't get your vehicle into the right gear while driving, you will have less control.

Manual Transmissions

Basic Method for Shifting Up. Most heavy vehicles with manual transmissions require double clutching to change gears. This is the basic method:

1. Release accelerator, push in clutch and shift to neutral at the same time.
2. Release clutch.
3. Let engine and gears **slow down** to the RPM required for the next gear (this takes practice).
4. Push in clutch and shift to the higher gear at the same time.
5. Release clutch and press accelerator at the same time.

Shifting gears using double clutching requires practice. If you remain too long in neutral, you may have difficulty putting the vehicle into the next gear. If so, don't try to force it. Return to neutral, release clutch, increase engine speed to match road speed, and try again.

Know When to Shift Up. There are two ways of knowing when to shift.

Use Engine Speed (RPM). Study the driver's manual for your vehicle and learn the operating RPM range. Watch your tachometer, and shift up when your engine reaches the top of the range. (Some newer vehicles use "progressive" shifting, the RPM at which you shift becomes higher as you move up in the gears. Find out what's right for the vehicle you will operate.)

Use road speed (MPH). Learn what speeds each gear is good for. Then, by using the speedometer, you'll know when to shift up.

With either method, you may learn to use engine sounds to know when to shift.

Basic Procedures for Shifting Down.

1. Release accelerator, push in clutch and shift to neutral at the same time.
2. Release clutch.
3. Press accelerator, **increase** engine and gear speed to the RPM required in the lower gear.
4. Push in clutch and shift to lower gear at the same time.
5. Release clutch and press accelerator at the same time.

Downshifting, like upshifting, requires knowing when to shift. Use either the tachometer or the speedometer and downshift at the right RPM or road speed.

Special conditions where you should downshift are:

- **Before starting down hill.** Slow down and shift down to a speed that you can control without using the brakes hard. Otherwise the brakes can overheat and lose their braking power. Downshift **before** starting down the hill. Make sure you are in a low enough gear, usually lower than the gear required to climb the same hill.
- **Before entering a curve.** Slow down to a safe speed, and downshift to the right gear before entering the curve. This lets you use some power through the curve to help the vehicle to be more stable while turning. It also lets you speed up as soon as you are out of the curve.

Multi-Speed Rear Axles and Auxiliary Transmissions

Multi-speed rear axles and auxiliary transmissions are used on many vehicles to provide extra gears. You usually control them by a selector knob or switch on the gearshift lever of the main transmission. There are many different shift patterns. Learn the right way to shift gears.

Automatic Transmissions

Some vehicles have automatic transmissions. You can select a low range to get greater engine braking when going down grades. The lower ranges prevent the transmission from shifting up beyond the selected gear (unless the governor RPM is exceeded). It is very important to use this braking effect when going down grades.

Retarders

Some vehicles have "retarders." Retarders help slow a vehicle, reducing the need for using your brakes. They reduce brake wear and give you another way to slow down. There are many types of retarders (exhaust, engine, hydraulic, electric). All retarders can be turned "on" or "off" by the driver. On some the retarding power can be adjusted. When turned "on", retarders apply their braking power (to the drive wheels only) whenever you let up on the accelerator pedal all the way.

Caution. When your drive wheels have poor traction, the retarder may cause them to skid. Therefore, you should turn the retarder "off" whenever the road is wet, icy or snow covered.

Test Your Knowledge

1. What are the two special conditions where you should downshift?
2. When should you downshift automatic transmissions?
3. Retarders keep you from skidding when the road is slippery. True or false?
4. What are two ways to know when to shift?

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.4 SHIFTING GEARS.**

2.5 SEEING

Seeing Ahead

To be a safe driver you need to know what's going on all around your vehicle. Not seeing a potentially dangerous situation is a major cause of accidents.

All drivers look ahead; but many don't look **far enough** ahead.

Importance of Looking Far Enough Ahead. Because stopping or changing lanes can take a lot of distance, knowing what the traffic is doing on all sides of you is very important. You need to look well ahead to make sure you have room to make these moves safely.

Seeing to the Sides and Rear

How Far Ahead to Look. Most good drivers look 12 to 15 seconds ahead. That means looking ahead the distance you will travel in 12 to 15 seconds. At lower speeds, that's about one block. At highway speeds it's about a quarter of a mile. If you're not looking that far ahead, you may have to stop too quickly or make quick lane changes. Looking 12 to 15 seconds ahead doesn't mean not paying attention to things that are closer. Good drivers shift their attention back and forth, near and far.

Look For Traffic. Look for vehicles coming onto the highway or into your lane or turning. Watch for brake lights from slowing vehicles. By seeing these things far enough ahead, you can change your speed or change lanes if necessary to avoid a problem.

Look For Road Conditions. Look for hills and curves - anything for which you'll have to slow or change lanes for. Pay attention to traffic signals and signs. If a light has been green for a long time, it will probably change before you get there. Start slowing down and be ready to stop. Traffic signs may alert you to road conditions where you may have to change speed.

It is important to know what's going on behind and to the sides. Check your mirrors regularly. Check more often in special situations.

Regular Checks. You need to make regular checks of your mirrors to be aware of traffic and to check your vehicle.

Traffic. Check the mirrors for vehicles on either side and in back of you. In an emergency, you may need to know whether you can make a quick lane change. Use your mirrors to spot overtaking vehicles. There are "blind spots" that your mirrors cannot show you. Check your mirrors regularly to know where other vehicles are around you, and to see if they move into your "blind spots".

Check Your Vehicle. Use the mirrors to keep an eye on your tires. It's one way to spot a tire fire. If you're carrying open cargo, you can use the mirrors to check it. Look for loose straps, ropes or chains. Watch for a flapping or ballooning tarp.

Special Situations. Special situations require more than regular mirror checks. These are lane changes, turns, merges, and tight maneuvers.

Lane Changes. You need to check your mirrors to make sure no one is alongside you or about to pass you. Check your mirrors:

- Before you change lanes to make sure there is enough room.
- After you have signaled, to check that no one has moved into your blind spot.
- Right after you start the lane change to double-check that your path is clear.
- After you complete the lane change.

Turns. In turns, check your mirrors to make sure that the rear of your vehicle will not hit anything.

Merges. When merging, use your mirrors to make sure the gap in traffic is large enough for you to enter safely.

Tight Maneuvers. Any time you are driving in close quarters check your mirrors often. Make sure you have enough clearance.

How to Use Mirrors. Use mirrors correctly by checking them quickly and understanding what you see.

Checking Quickly. When you use your mirrors while driving on the road, check quickly. Look back and forth between the mirrors and the road ahead. Do not focus on the mirrors for too long. Otherwise, you will travel quite a distance without knowing what's happening ahead.

Understanding What You See. Many large vehicles have curved (convex, "fisheye", "spot", "bug eye") mirrors that show a wider area than flat mirrors. This is often helpful. But everything appears smaller in a convex mirror than it would if you were looking at it directly. Things also seem father away than they really are. It is important to realize this and to allow for it.

2.6 COMMUNICATING

Signal Your Intentions

Other drivers do not know what you are going to do until you tell them.

Signaling what you intend to do is important for safety. Here are some general rules for signaling.

Turns. There are three good rules for using turn signals.

1. Signal early. Signal well before you turn. It is the best way to keep others from trying to pass you.
2. Signal continuously. You need both hands on the wheel to turn safely. Do not cancel the signal until you have completed the turn.
3. Cancel your signal. Do not forget to turn off your turn signal after you've turned (if you do not have self-canceling signals or if the turn was not sharp enough for the signal to cancel itself).

Lane Changes. Put your turn signal on **before** changing lanes. Change lanes slowly and smoothly. That way drivers you didn't see may have a chance to honk their horn or avoid your vehicle.

Slowing Down. Warn drivers behind you when you see you'll need to slow down. A few light taps on the brake pedal - enough to flash the brake lights - should warn following drivers. Use the hazard warning signal flashers when you are driving very slow or are stopped. Warn other drivers in any of the following situations:

- **Trouble Ahead.** The size of your vehicle makes it hard for drivers behind you to see hazards ahead. If you see a hazard that will require slowing down, warn the drivers behind by flashing your brake lights or hazard lights.

- **Tight Turns.** Most car drivers don't know how slow you have to go to make a tight turn in a large vehicle. Give drivers behind you warning by braking early and slowing gradually.
- **Stopping On the Road.** Truck and bus drivers sometimes stop on the road to unload cargo or passengers or to stop at a railroad crossing. Warn following drivers by flashing your brake lights and hazard lights. Do not stop suddenly.
- **Driving Slowly.** Drivers often do not realize how fast they are catching up to a slow vehicle until they are very close. If you must drive slowly, alert following drivers by turning on your hazard warning lights if it is legal. (Laws vary regarding the use of hazard warning lights when traveling on a limited access highway and maintaining a speed higher than 40 mph but slower than the speed of traffic on the highway due to the gradient. Check the laws of the states where you will drive.)
- **Don't Direct Traffic.** Some drivers try to help out others by signaling when it is safe to pass. You should not do this. You could cause an accident. You could be blamed and it could cost you many thousands of dollars.

Communicating Your Presence

Other drivers may not notice your vehicle even when it's in plain sight. Let them know you're there to help prevent accidents.

When Passing. Whenever you are about to pass a vehicle, pedestrian, or bicyclist, assume they do not see you. They could suddenly move in front of you. Tap the horn lightly or, at night, flash your headlights from low to high beam and back. Drive carefully enough to avoid a crash even if they do not see or hear you.

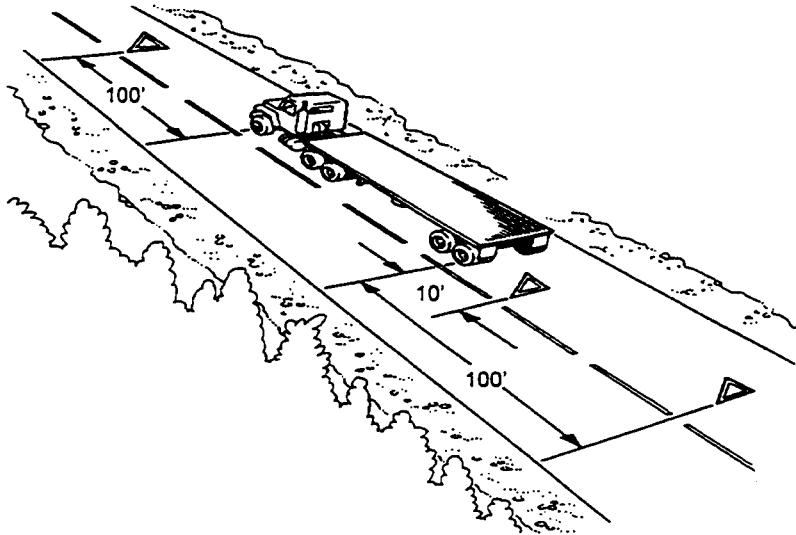
When It is Hard To See. At dawn or dusk or in rain or snow, you need to make yourself easier to see. If you are having trouble seeing other vehicles, other drivers will have trouble seeing you. Turn on your lights. Use the headlights, not just the identification or clearance lights. Use the low beams, high beams can bother people in the daytime as at night.

When Parked at the Side of the Road. When you pull off the road and stop, be sure to turn on the 4-way hazard lights. This is important at night. Don't trust the taillights to give warning. Drivers have crashed into the rear of a parked vehicle because they thought it was moving normally.

If you must stop on a road or on the shoulder of a road, you should put out your reflective triangles as soon as possible. Place your warning devices at the following locations:

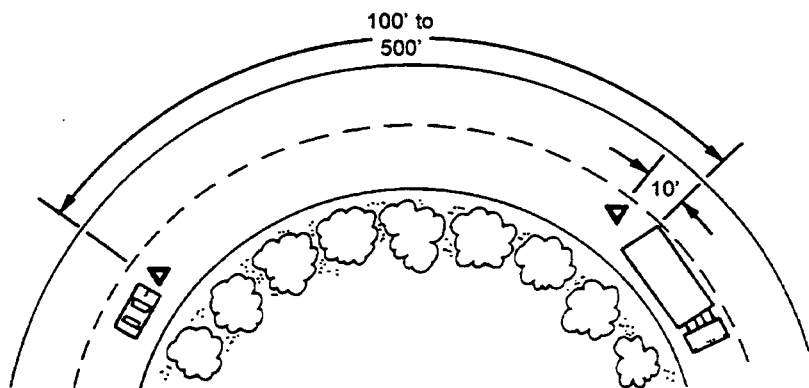
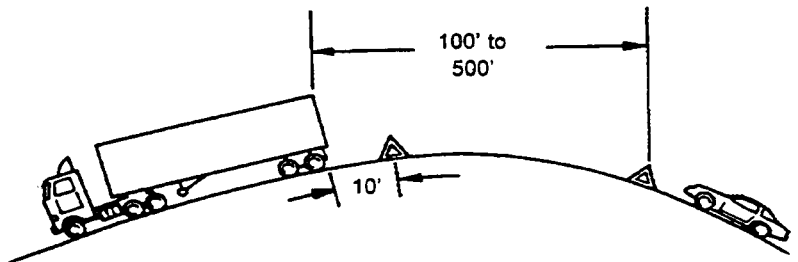
- If you stop on a 2-lane road carrying traffic in both directions or on an undivided highway, place warning devices within ten feet of the front or rear corners to mark the location of the vehicle and 100 feet behind and ahead of the vehicle, on the shoulder or in the lane you stopped as shown in Figure 12.

**Figure 12: Warning
Devices, Straight
Roadway**



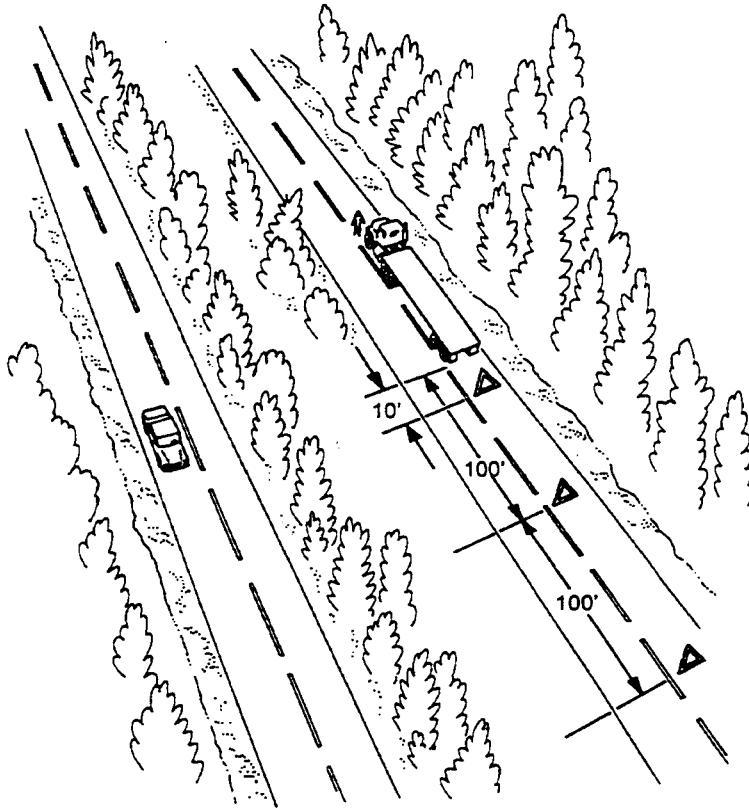
- If you stop beyond a hill, curve, or other obstruction that prevents other drivers from seeing the vehicle, place the warning devices within 500 feet of the vehicle as shown in Figure 13.

**Figure 13: Warning
Devices, Curve or Hill**



- If you must stop on or by a one-way or divided highway, place warning devices 10 feet, 100 feet, and 200 feet toward the approaching traffic as shown in Figure 14.

Figure 14: Warning Devices, One-Way or Divided Highway



When putting out the triangles, hold them between yourself and the oncoming traffic for your own safety. (So other drivers can see you.)

Use Your Horn When Needed. Your horn can let others know you're there. It can help to avoid a crash. Use your horn when needed. However, it can startle others and could be dangerous when used unnecessarily.

2.7 CONTROLLING SPEED

Driving too fast is a major cause of fatal crashes. You must adjust your speed depending on driving conditions. These include traction, curves, visibility, traffic, and hills.

Speed and Stopping Distances

There are three things that add up to total stopping distance:

$$\begin{array}{r}
 \text{Perception Distance} \\
 + \text{Reaction Distance} \\
 + \text{Braking Distance} \\
 \hline
 = \text{Total Stopping Distance}
 \end{array}$$

- **Perception distance.** This is the distance your vehicle travels from the time your eyes see a hazard until your brain recognizes it. The perception time for an alert driver is about 3/4 second. At 55 mph, you travel 60 feet in 3/4 second.
- **Reaction distance.** The distance traveled from the time your brain tells your foot to move from the accelerator until your foot is actually pushing the brake pedal. The average driver has a reaction time of 3/4 second. This accounts for an additional 60 feet traveled at 55 mph.
- **Braking distance.** The distance it takes to stop once the brakes are put on. At 55 mph on dry pavement with good brakes it can take a heavy vehicle about 170 feet to stop. It takes about 4 1/2 seconds.

Total Stopping Distance. At 55 mph it will take about 6 seconds to stop and your vehicle will travel about the distance of a football field. (60 + 60 + 170 = 290 feet.)

The Effect of Speed on Stopping Distance. Whenever you double your speed, it takes about **four** times as much distance to stop and your vehicle will have **four** times the destructive power if it crashes. High speeds increase stopping distances greatly. By slowing down a little, you can gain a lot in reduced braking distance.

The Effect of Vehicle Weight on Stopping Distance. The heavier the vehicle, the more work the brakes must do to stop it and the more heat they absorb. But the brakes, tires, springs, and shock absorbers on heavy vehicles are designed to work best when the vehicle is fully loaded. **Empty** trucks require **greater** stopping distances, because an empty vehicle has less traction. It can bounce and lock up its wheels, giving much poorer braking. (This is not usually the case with buses.)

You can't steer or brake a vehicle unless you have traction. Traction is friction between the tires and the road. There are some road conditions that reduce traction and call for lower speeds.

Matching Speed to the Road Surface

Slippery Surfaces. It will take longer to stop and it will be harder to turn without skidding when the road is slippery. You must drive slower to be able to stop in the same distance as on a dry road. Wet roads can double stopping distance. Reduce speed by about one third (e.g., slow from 55 to about 35 mph) on a wet road. On packed snow, reduce speed by a half, or more. If the surface is icy, reduce speed to a crawl and stop driving as soon as you can safely do so.

Identifying Slippery Surfaces. Sometimes it's hard to know if the road is slippery. Here are some signs of slippery roads.

Shaded Areas. Shady parts of the road will remain icy and slippery long after open areas have melted.

Bridges. When the temperature drops, bridges will freeze before the road will. Be especially careful when the temperature is close to 32 degrees F.

Melting Ice. Slight melting will make ice wet. Wet ice is much more slippery than ice that is not wet.

Black Ice. Black ice is a thin layer that is clear enough that you can see the road underneath it. It makes the road look wet. Any time the temperature is below freezing and the road looks wet, watch out for black ice.

Vehicle Icing. An easy way to check for ice is to open the window and feel the front of the mirror, mirror support, or antenna. If there's ice on these, the road surface is probably starting to ice up.

Just After Rain Begins. Right after it starts to rain, the water mixes with oil left on the road by vehicles. This makes the road very slippery. If the rain continues, it will wash the oil away.

Hydroplaning. In some weather, water or slush collects on the road. When this happens, your vehicle can hydroplane. It's like water skiing. The tires lose their contact with the road and have little or no traction. You may not be able to steer or brake. You can regain control by releasing the accelerator and pushing in the clutch. This will slow your vehicle and let the wheels turn freely. If the vehicle is hydroplaning, do not use the brakes to slow down. If the drive wheels start to skid, push in the clutch to let them turn freely.

It does not take a lot of water to cause hydroplaning. Hydroplaning can occur at speeds as low as 30 mph if there is a lot of water. Hydroplaning is more likely if tire pressure is low or the tread is worn. (The grooves in a tire carry away the water; if they aren't deep, they don't work well.) Be especially careful driving through puddles. The water is often deep enough to cause hydroplaning.

Speed and Curves

Drivers must adjust their speed for curves in the road. If you take a curve too fast, two things can happen. The tires can lose their traction and continue straight ahead, so you skid off the road. Or, the tires may keep their traction and the vehicle rolls over. Tests have shown that trucks with a high center of gravity can roll over at the posted speed limit for a curve.

Slow to a safe speed **before** you enter a curve. Braking in a curve is dangerous because it is easier to lock the wheels and cause a skid. Slow down as needed. Don't ever exceed the posted speed limit for the curve. Be in a gear that will let you accelerate slightly in the curve. This will help you keep control.

Speed and Distance Ahead

You should always be able to stop within the distance you can see ahead. Fog, rain or other conditions may require that you slow down to be able to stop in the distance you can see. At night, you can't

see as far with low beams as you can with high beams. When you must use low beams, slow down.

Speed and Traffic Flow

When you're driving in heavy traffic, the safest speed is the speed of other vehicles. Vehicles going the same direction at the same speed are not likely to run into one another. Drive at the speed of the traffic, if you can without going at an illegal or unsafe speed. Keep a safe following distance.

The main reason drivers exceed speed limits is to save time. But anyone trying to drive faster than the speed of traffic will not be able to save much time. The risks involved are not worth it. If you go faster than the speed of other traffic, you'll have to keep passing other vehicles. This increases the chance of a crash; and it is more tiring. Fatigue increases the chance of a crash. Going with the flow of traffic is safer and easier.

Speed on Downgrades

Your vehicle's speed will increase on downgrades because of gravity. Your most important objective is to select and maintain a speed that is not too fast for the:

- Total weight of the vehicle and cargo
- Length of the grade
- Steepness of the grade
- Road conditions
- Weather.

If a speed limit is posted, or there is a sign indicating "Maximum Safe Speed", never exceed the speed shown. Also, look for and heed warning signs indicating the length and steepness of the grade. You must use the braking effect of the engine as the principal way of controlling your speed on downgrades. The braking effect of the engine is greatest when it is near the governed RPMs and the transmission is in the lower gears. Save your brakes so you will be able to slow or stop as required by road and traffic conditions. Shift your transmission to a low gear before starting down the grade and use the proper braking techniques. Please read carefully the section on going down long steep downgrades safely in "Mountain Driving".

Test Your Knowledge

1. How far ahead does the manual say you should look?
2. What are two main things to look ahead for?
3. What's your most important way to see to the sides and rear?
4. What does "communicating" mean in safe driving?
5. Where should your reflectors be placed when stopped on a divided highway?
6. What three things add up to total stopping distance?
7. If you go twice as fast, will your stopping distance increase by twice or four times?
8. Empty trucks have the best braking. True or False?
9. What is hydroplaning?
10. What is "black ice?"

These questions may be on the test. If you are unable to answer all of the questions, re-read 2.5 SEEING, 2.6 COMMUNICATING AND 2.7 CONTROLLING SPEED.

2.8 MANAGING SPACE

To be a safe driver, you need space all around your vehicle. When things go wrong, space gives you time to think and to take action.

To have space available when something goes wrong, you need to **manage** space. While this is true for all drivers, it is very important for large vehicles. They take up more space and they require more space for stopping and turning.

Space Ahead

Of all the space around your vehicle, it is the area ahead of the vehicle - the space you're driving into - that is most important.

The Need for Space Ahead. You need space ahead in case you must suddenly stop. According to accident reports, the vehicle that trucks and buses most often run into is the one in front of them. The most frequent cause is **following too closely**. Remember, if the vehicle ahead of you is smaller than yours, it can probably stop faster than you can. You may crash if you are following too closely.

How Much Space? How much space should you keep in front of you? One good rule says you need at least one second for each 10 feet of vehicle length at speeds below 40 mph. At greater speeds, you must add one second for safety. For example, if you are driving a 40-foot vehicle, you should leave 4 seconds between you and the vehicle ahead. In a 60-foot rig, you'll need 6 seconds. Over 40 mph,

you'd need 5 seconds for a 40-foot vehicle and 7 seconds for a 60-foot vehicle.

To know how much space you have, wait until the vehicle ahead passes a shadow on the road, a pavement marking, or some other clear landmark. Then count off the seconds like this: "one thousand-and-one, one thousand-and-two" and so on, until you reach the same spot. Compare your count with the rule of one second for every 10 feet of length. If you are driving a 40 foot truck and only counted up to 2 seconds, you're too close. Drop back a little and count again until you have 4 seconds of following distance (or 5 seconds, if you're going over 40 mph). After a little practice, you will know how far back you should be. Remember to add one second for speeds above 40 mph. Also remember that when the road is slippery, you need **much more space** to stop.

Space Behind

You can't stop others from following you too closely. But there are things you can do to make it safer.

Stay to the Right. Heavy vehicles are often tailgated when they can't keep up with the speed of traffic. This often happens when you're going uphill. If a heavy load is slowing you down, stay in the right lane if you can. Going uphill, you should not pass another slow vehicle unless you can get around quickly and safely.

Dealing with Tailgaters Safely. In a large vehicle, it's often hard to see whether a vehicle is close behind you. You may be tailgated:

- When you are traveling slowly. Drivers trapped behind slow vehicles often follow closely.
- In bad weather. Many car drivers follow large vehicles closely during bad weather, especially when it is hard to see the road ahead.

If you find yourself being tailgated, here are some things you can do to reduce the chances of a crash:

- Avoid quick changes. If you have to slow down or turn, signal early and reduce speed very gradually.
- Increase your following distance. Opening up room in front of you will help you to avoid having to make sudden speed or direction changes. It also makes it easier for the tailgater to get around you.
- Don't speed up. It's safer to be tailgated at a low speed than a high speed.
- Avoid tricks. Don't turn on your taillights or flash your brake lights. Follow the suggestions above.

Space to the Sides

Commercial vehicles are often wide and take up most of a lane. Safe drivers will manage what little space they have. You can do this by keeping your vehicle centered in your lane, and avoid driving alongside others.

Staying Centered in a Lane. You need to keep your vehicle centered in the lane to keep safe clearance on either side. If your vehicle is wide, you have little room to spare.

Traveling Next to Others. There are two dangers in traveling alongside other vehicles:

- Another driver may change lanes suddenly and turn into you.
- You may be trapped when **you** need to change lanes.

Find an open spot where you aren't near other traffic. When traffic is heavy, it may be hard to find an open spot. If you must travel near other vehicles, try to keep as much space as possible between you and them. Also, drop back or pull forward so that you are sure the other driver can see you.

Strong Winds. Strong winds make it difficult to stay in your lane. The problem is usually worse for lighter vehicles. This problem can be especially bad coming out of tunnels. Don't drive alongside others if you can avoid it.

Space Overhead

Hitting overhead objects is a danger. Make sure you always have overhead clearance.

- Don't assume that the heights posted at bridges and overpasses are correct. Re-paving or packed snow may have reduced the clearances since the heights were posted.
- The weight of a cargo van changes its height. An empty van is higher than a loaded one. That you got under a bridge when you were loaded does not mean that you can do it when you are empty.
- If you doubt you have safe space to pass under an object, go slowly. If you aren't sure you can make it, take another route. Warnings are often posted on low bridges or underpasses, but sometimes they are not.
- Some roads can cause a vehicle to tilt. There can be a problem clearing objects along the edge of the road, such as signs, trees or bridge supports. Where this is a problem, drive a little closer to the center of the road.
- Before you back into an area, get out and check for overhanging objects, such as trees, branches, or electric wires. It's easy to miss seeing them while you are backing. (Also check for other hazards at the same time.)

Space Below

Many drivers forget about the space under their vehicles. That space can be very small when a vehicle is heavily loaded. Railroad tracks can stick up several inches. This is often a problem on dirt roads and in unpaved yards where the surface around the tracks can wear away. Don't take a chance on getting hung up halfway across. Drainage channels across roads can cause the end of some vehicles to drag. Cross such depressions carefully.

Space for Turns

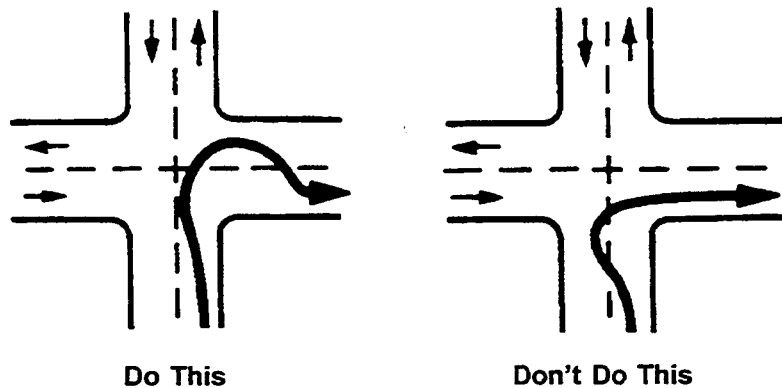
The space around a truck or bus is important in turns. Because of wide turning and off-tracking, large vehicles can hit other vehicles or objects during turns.

Right Turns. Here are some rules to help prevent right-turn crashes:

- Turn slowly to give yourself and others more time to avoid problems.

- If you are driving a truck or bus that cannot make the right turn without swinging into another lane, turn wide as you **complete** the turn, as shown in Figure 15. Keep the rear of your vehicle close to the curb. This will stop other drivers from passing you on the right.
- Don't turn wide to the left as you start the turn, as shown in Figure 15. A following driver may think you are turning left and try to pass you on the right. You may crash into the other vehicle as you complete your turn.
- If you must cross into the oncoming lane to make a turn, watch out for vehicles coming toward you. Give them room to go by or to stop. However, don't back up for them, because you might hit someone behind you.

Figure 15: Right Turns



Left Turns. On a left turn, make sure you have reached the center of the intersection before you start the left turn. If you turn too soon, the left side of your vehicle may hit another vehicle because of off-tracking.

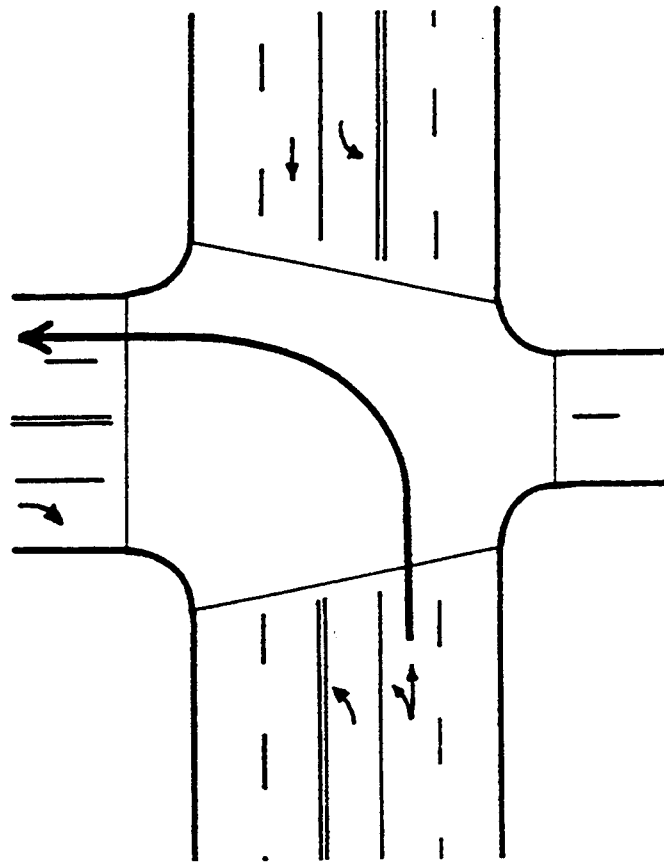
If there are two turning lanes, always take the right-hand turn lane, as shown in Figure 16. Don't start in the inside lane because you may have to swing right to make the turn. Drivers on your left can be more readily seen.

Space Needed to Cross or Enter Traffic

Be aware of the size and weight of your vehicle when you cross or enter traffic. Here are some important things to keep in mind:

- Because of slow acceleration and the space large vehicles require, you may need a much larger gap to enter traffic than you would in a car.
- Acceleration varies with the load. Allow more room if your vehicle is heavily loaded.
- Before you start across a road, make sure you can get all the way across before traffic reaches you.

Figure 16: Left Turns



**If there are two left turn lanes,
use the right hand lane.**

Test Your Knowledge

1. How do you find out how many seconds of following distance space you have?
2. If you are driving a 30 foot vehicle at 55 mph, how many seconds of following distance should you allow?
3. You should decrease your following distance if somebody is following you too closely. True or False?
4. If you swing wide to the left before turning right, another driver may try to pass you on the right. True or False?

These questions may be on the test. If you are unable to answer all of the questions, re-read 2.8 MANAGING SPACE.

2.9 DRIVING AT NIGHT

It's More Dangerous

You are at greater risk when you drive at night. Drivers can't see hazards as soon as in daylight, so they have less time to respond. Drivers caught by surprise are less able to avoid a crash.

The problems of night driving involve the driver, the roadway, and the vehicle. We will discuss each of these factors.

Driver Factors

Vision. People can't see as sharply at night or in dim light. Also, their eyes need time to adjust to seeing in dim light. Most people have noticed this when walking into a dark movie theater.

Glare. Drivers can be blinded for a short time by bright light. It takes time to recover from this blindness. Older drivers are especially bothered by glare. Most people have been temporarily blinded by camera flash units or by the high beams of an oncoming vehicle. It can take several seconds to recover from glare. Even two seconds of glare blindness can be dangerous. A vehicle going 55 mph will travel more than half the distance of a football field during that time. Don't look directly at bright lights when driving. Look at the right side of the road. Watch the sidelines when someone coming toward you has very bright lights.

Fatigue and Lack of Alertness. Fatigue (being tired) and lack of alertness are bigger problems at night. The body's need for sleep is beyond a person's control. Most people are less alert at night, especially after midnight. This is particularly true if you have been driving for a long time. Drivers may not see hazards as soon or react as quickly, so the chance of a crash is greater. If you are sleepy, the only safe cure is to get off the road and get some sleep. If you don't, you risk your life and the lives of others.

Roadway Factors

Poor Lighting. In the daytime there is usually enough light to see well. This is not true at night. Some areas may have bright street lights, but many areas will have poor lighting. On most roads you will probably have to depend entirely on your headlights.

Less light means you will not be able to see hazards as well as in daytime. Road users who do not have lights are hard to see. There are many accidents at night involving pedestrians, joggers, bicyclists, and animals.

Even when there are lights, the road scene can be confusing. Traffic signals and hazards can be hard to see against a background of signs, shop windows, and other lights.

Drive slower when lighting is poor or confusing. Drive slowly enough to be sure you can stop in the distance you can see ahead.

Drunk Drivers. Drunk drivers and drivers under the influence of drugs are a hazard to themselves and to you. Be especially alert around the closing times for bars and taverns. Watch for drivers who have trouble staying in their lane or maintaining speed, stop without

reason, or show other signs of being under the influence of alcohol or drugs.

Vehicle Factors

Headlights. At night your headlights will usually be the main source of light for you to see and for others to see you. You can't see nearly as much with your headlights as you can see in the daytime. With low beams you can see ahead about 250 feet and with high beams about 350-500 feet. You must adjust your speed to keep your stopping distance within your sight distance. This means going slow enough to be able to stop within the range of your headlights. Otherwise, by the time you see a hazard, you will not have time to stop.

Night driving can be more dangerous if you have problems with your headlights. Dirty headlights may give only half the light they should. This cuts down your ability to see, and makes it harder for others to see you. Make sure your lights are clean and working. Headlights can be out of adjustment. If they don't point in the right direction, they won't give you a good view and they can blind other drivers. Have a qualified person make sure they are adjusted properly.

Other Lights. In order for you to be seen easily, the following must be clean and working properly:

- Reflectors
- Marker lights
- Clearance lights
- Taillights
- Identification lights.

Turn Signals and Brake Lights. At night your turn signals and brake lights are even more important for telling other drivers what you intend to do. Make sure you have clean, working turn signals and stop lights.

Windshield and Mirrors. It is more important at night than in the daytime to have a clean windshield and clean mirrors. Bright lights at night can cause dirt on your windshield or mirrors to create a glare of its own, blocking your view. Most people have experienced driving toward the sun just as it has risen or is about to set and found that they can barely see through a windshield that seemed to look o.k. in the middle of the day. Clean your windshield on the inside and outside for safe driving at night.

Night Driving Procedures

Pre-Trip Procedures. Make sure you are rested and alert. If you are drowsy, **sleep** before you drive! Even a nap can save your life or the lives of others. If you wear eye glasses, make sure they are clean and unscratched. Don't wear sun glasses at night. Do a complete pre-trip inspection of your vehicle. Pay attention to checking all lights and reflectors and cleaning those you can reach.

Avoid Blinding Others. Glare from your headlights can cause problems for drivers coming towards you. They can also bother drivers going in the same direction you are, when your lights shine in their rear view mirrors. Dim your lights before they cause glare for

other drivers. Dim your lights within 500 feet of an oncoming vehicle and when following another vehicle within 500 feet.

Avoid Glare from Oncoming Vehicles. Do not look directly at lights of oncoming vehicles. Look slightly to the right at a right lane or edge marking, if available. If other drivers don't put their low beams on, don't try to "get back at them" by putting your own high beams on. This increases glare for oncoming drivers and increases the chance of a crash.

Use High Beams When You Can. Some drivers make the mistake of always using low beams. This seriously cuts down on their ability to see ahead. Use high beams when it is safe and legal to do so. Use them when you are not within 500 feet of an approaching vehicle. Also, don't let the inside of your cab get too bright. This makes it harder to see outside. Keep the interior light off and adjust your instrument lights as low as you can and still be able to read the gauges.

If You Get Sleepy, Stop Driving at the Nearest Safe Place. People often don't realize how close they are to falling asleep even when their eyelids are falling shut. If you can safely do so, look at yourself in a mirror. If you look sleepy, or you just feel sleepy, **stop driving!** You are in a very dangerous condition. The only safe cure is to sleep.

2.10 DRIVING IN FOG

The best advice for driving in fog is don't. It is preferable that you pull off the road into a rest area or truck stop until visibility is better.

If you must drive, be sure to consider the following:

- Obey all fog-related warning signs
- Slow before you enter fog
- Turn on all your lights (headlights should be on low beams)
- Be prepared for emergency stops.

2.11 DRIVING IN WINTER

Vehicle Checks

Make sure your vehicle is ready before driving in winter weather. You should make a regular pre-trip inspection, paying extra attention to the following items:

Coolant Level and Antifreeze Amount. Make sure the cooling system is full and there is enough anti-freeze in the system to protect against freezing. This can be checked with a special coolant tester.

Defrosting and Heating Equipment. Make sure the defrosters work. They are needed for safe driving. Make sure the heater is working,

and that you know how to operate it. If you use other heaters and expect to need them (e.g., mirror heaters, battery box heaters, fuel tank heaters), check their operation.

Wipers and Washers. Make sure the windshield wiper blades are in good condition. Make sure the wiper blades press against the window hard enough to wipe the windshield clean. Otherwise they may not sweep off snow properly. Make sure the windshield washer works and there is washing fluid contained in the washer reservoir.

Use windshield washer antifreeze to prevent freezing of the washer liquid. If you can't see well enough while driving (for example, if your wipers fail), stop safely and fix the problem.

Tires. Make sure you have enough tread on your tires. The drive tires must provide traction to push the rig over wet pavement and through snow. The steering tires must have traction to steer the vehicle. Enough tread is especially important in winter conditions. You must have at least 4/32 inch tread depth in every major groove on front tires and at least 2/32 inch on other tires. More would be better. Also, make sure the tires are properly inflated. Use the correct gauges to determine if you have enough tread and the proper tire pressure for safe driving.

Tire Chains. You may find yourself in conditions where you can't drive without chains, even to get to a place of safety. Carry the right number of chains and extra cross links. Make sure they will fit your drive tires. Check the chains for broken hooks, worn or broken cross links, and bent or broken side chains. Learn how to put the chains on before you need to do it in snow and ice.

Lights and Reflectors. Make sure the lights and reflectors are clean. Lights and reflectors are especially important during bad weather. Check from time to time during bad weather to make sure they are clean and working right.

Windows and Mirrors. Remove any ice, snow, etc., from the windshield, windows, and mirrors before starting. Use a windshield scraper, snow brush, and windshield defroster as necessary.

Hand Holds, Steps, and Deck Plates. Remove all ice and snow from hand holds, steps, and deck plates which you must use to enter the cab or to move about the vehicle. This will reduce the danger of slipping.

Radiator Shutters and Winterfronts. Remove ice from the radiator shutters. Make sure the winterfront is not closed too tightly. If the shutters freeze shut or the winterfront is closed too much, the engine may overheat and stop.

Exhaust System. Exhaust system leaks are especially dangerous when cab ventilation may be poor (windows rolled up, etc.). Loose connections could permit poisonous carbon monoxide to leak into your vehicle. Carbon monoxide gas will cause you to be sleepy. In large enough amounts it can kill you. Check the exhaust system for loose parts and for sounds and signs of leaks.

Driving

Slippery Surfaces. Drive slowly and smoothly on slippery roads. If it is very slippery, you shouldn't drive at all. Stop at the first safe place.

The following are some safety guidelines.

Start Gently and Slowly. When first starting, get the feel of the road. Don't hurry.

Adjust Turning and Braking to Conditions. Make turns as gentle as possible. Don't brake any harder than necessary, and don't use the engine brake or speed retarder. (They can cause the driving wheels to skid on slippery surfaces.)

Adjust Speed to Conditions. Don't pass slower vehicles unless necessary. Go slow and watch far enough ahead to keep a steady speed. Avoid having to slow down and speed up. Take curves at slower speeds and don't brake while in curves. Be aware that as the temperature rises to the point where ice begins to melt, the road becomes even more slippery. Slow down more.

Adjust Space to Conditions. Don't drive alongside other vehicles. Keep a longer following distance. When you see a traffic jam ahead, slow down or stop to wait for it to clear. Try hard to anticipate stops early and slow down gradually.

Wet Brakes. When driving in heavy rain or deep standing water, your brakes will get wet. Water in the brakes can cause the brakes to be weak, to apply unevenly or to grab. This can cause lack of braking power, wheel lockups, pulling to one side or the other and jackknife if you pull a trailer.

Avoid driving through deep puddles or flowing water if possible. If not, you should:

- Slow down
- Place transmission in a low gear
- Gently put on the brakes. This presses linings against brake drums or discs and keeps mud, silt, sand, and water from getting in
- Increase engine RPM and cross the water while keeping light pressure on the brakes
- When out of the water, maintain light pressure on the brakes for a short distance to heat them up and dry them out
- Make a test stop when safe to do so. Check behind to make sure no one is following, then apply the brakes to be sure they work right. If not, dry out further as described above. (CAUTION: Do not apply too much brake pressure and accelerator at the same time or you can overheat brake drums and linings.)

2.12 DRIVING IN VERY HOT WEATHER

Vehicle Checks

Do a normal pre-trip inspection, but pay special attention to the following items:

Tires. Check the tire mounting and air pressure. Inspect the tires every two hours or every 100 miles when driving in very hot weather. Air pressure increases with temperature. Do not let air out or the pressure will be too low when the tires cool off. If a tire is too hot to touch, remain stopped until the tire cools off. Otherwise the tire may blow out or catch fire.

Engine Oil. The engine oil helps keep the engine cool, as well as lubricating it. Make sure there is enough engine oil. If you have an oil temperature gauge, make sure the temperature is within the proper range while you are driving.

Engine Coolant. Before starting out, make sure the engine cooling system has enough water and antifreeze according to the engine manufacturer's directions. (Antifreeze helps the engine under hot conditions as well as cold conditions.) When driving, check the water temperature or coolant temperature gauge from time to time. Make sure that it remains in the normal range. If the gauge goes above the highest safe temperature, there may be something wrong that could lead to engine failure and possibly fire. Stop driving as soon as safely possible and try to find out what is wrong.

Some vehicles have sight glasses, see-through coolant overflow containers or coolant recovery containers. These permit you to check the coolant level while the engine is hot. If the container is not part of the pressurized system, the cap can be safely removed and coolant added even when the engine is at operating temperature.

Never remove the radiator cap or any part of the pressurized system until the system has cooled. Steam and boiling water can spray under pressure and cause severe burns. If you can touch the radiator cap with your bare hand, it is probably cool enough to open.

If coolant has to be added to a system without a recovery tank or overflow tank, follow these steps:

- Shut engine off
- Wait until engine has cooled
- Protect hands (use gloves or a thick cloth)
- Turn radiator cap slowly to the first stop, which releases the pressure seal
- Step back while pressure is released from cooling system
- When all pressure has been released, press down on the cap and turn it further to remove it
- Visually check level of coolant and add more coolant if necessary
- Replace cap and turn all the way to the closed position.

Engine Belts. Learn how to check V-belt tightness on your vehicle by pressing on the belts. Loose belts will not turn the water pump and/or fan properly. This will result in overheating. Also, check belts for cracking or other signs of wear.

Hoses. Make sure coolant hoses are in good condition. A broken hose while driving can lead to engine failure and even fire.

Driving

Watch for Bleeding Tar. Tar in the road pavement frequently rises to the surface in very hot weather. Spots where tar "bleeds" to the surface are very slippery.

Go Slow Enough to Prevent Overheating. High speeds create more heat for tires and the engine. In desert conditions the heat may build up to the point where it is dangerous. The heat will increase chances of tire failure or even fire, and engine failure.

Test Your Knowledge

1. You should use low beams whenever you can. True or False?
2. What should you do before you drive if you are drowsy?
3. What effects can wet brakes cause? How can you avoid these problems?
4. You should let air out of hot tires so the pressure goes back to normal. True or False?
5. You can safely remove the radiator cap as long as the engine isn't overheated. True or False?

These questions may be on the test. If you are unable to answer all of the questions, re-read 2.9 DRIVING AT NIGHT, 2.10 DRIVING IN FOG, 2.11 DRIVING IN WINTER AND 2.12 DRIVING IN VERY HOT WEATHER.

2.13 RAILROAD CROSSINGS

Railroad crossings are always dangerous. Every such crossing must be approached with the expectation that a train is coming.

Never Race a Train to a Crossing

Never attempt to race a train to a crossing. It is extremely difficult to judge the speed of an approaching train.

Reduce Speed

Speed must be reduced in accordance with your ability to see approaching trains in any direction, and speed must be held to a point which will permit you to stop short of the tracks in case a stop is necessary.

Don't Expect to Hear a Train

Because of noise in the cab, you cannot expect to hear the train horn until the train is dangerously close to the crossing.

Don't Rely on Signals

You should not rely solely upon the presence of warning signals, gates, or flagmen to warn of the approach of trains.

Double tracks require a double check. Remember that a train on one track may hide a train on the other track. Look both ways before crossing. After one train has cleared a crossing, be sure no other trains are near before starting across the tracks.

Yard areas and grade crossings in cities and towns are just as dangerous as rural grade crossings. Approach them with as much caution.

Stop Requirements

A full-stop is required at grade crossings whenever:

- The nature of the cargo makes a stop mandatory under state or federal regulations.
- Such a stop is otherwise required by law.

Crossing the Tracks

Railroad crossings with steep approaches can cause your unit to hang up on the tracks.

Never permit traffic conditions to trap you in a position where you have to stop on the tracks. Be sure you can get all the way across the tracks before you start across.

Do not shift gears while crossing railroad tracks.

2.14 MOUNTAIN DRIVING

In mountain driving, gravity plays a major role. On any upgrade, gravity slows you down. The steeper the grade, the longer the grade, and/or the heavier the load - the more you will have to use lower gears to climb hills or mountains. In coming down, long steep downgrades, gravity causes the speed of your vehicle to increase. You must select an appropriate safe speed, then use a low gear, and use proper braking techniques. You should plan ahead and obtain information about any long steep grades along your planned route of travel. If possible, talk to other drivers who are familiar with the grades to find out what speeds are safe.

You must go slow enough so your brakes can hold you back without getting too hot. If the brakes become too hot, they may start to "fade." This means you have to apply them harder and harder to get

the same stopping power. If you continue to use the brakes hard, they can keep fading until you cannot slow down or stop at all.

Select a "Safe" Speed

Your most important consideration is to select a speed that is not too fast for the:

- Total weight of the vehicle and cargo
- Length of the grade
- Steepness of the grade
- Road conditions
- Weather.

If a speed limit is posted, or there is a sign indicating "Maximum Safe Speed", never exceed the speed shown. Also, look for and heed warning signs indicating the length and steepness of the grade.

You must use the braking effect of the engine as the principal way of controlling your speed. The braking effect of the engine is greatest when it is near the governed RPMs and the transmission is in the lower gears. Save your brakes so you will be able to slow or stop as required by road and traffic conditions.

Be in the Right Gear Before Starting Down the Grade

Shift the transmission to a low gear before starting down the grade. Do not try to downshift after your speed has already built up. You will not be able to shift into a lower gear. You may not even be able to get back into any gear and all engine braking effect will be lost. Forcing an automatic transmission into a lower gear at high speed could damage the transmission and also lead to loss of all engine braking effect.

With older trucks, a rule for choosing gears is to use the same gear going down a hill that you would need to climb the hill. However, new trucks have low friction parts and streamlined shapes for fuel economy. They may also have more powerful engines. This means they can go up hills in higher gears and have less friction and air drag to hold them back going down hills. For that reason, drivers of modern trucks may have to use lower gears going down a hill than would be required to go up the hill. You should know what is right for your vehicle.

Brake Fading or Failure

Brakes are designed so brake shoes or pads rub against the brake drum or disks to slow the vehicle. Braking creates heat, but brakes are designed to take a lot of heat. However, brakes can fade or fail from excessive heat caused by using them too much and not relying on the engine braking effect.

Brake fade is also affected by adjustment. To safely control a vehicle, every brake must do its share of the work. Brakes out of adjustment will stop doing their share before those that are in adjustment. The other brakes can then overheat and fade, and there will not be enough braking available to control the vehicle. Brakes can get out of adjustment quickly, especially when they are used a lot; also, brake linings wear faster when they are hot. Therefore, brake adjustment must be checked frequently.

Proper Braking Technique

Remember. The use of brakes on a long and/or steep downgrade is only a supplement to the braking effect of the engine. Once the vehicle is in the proper low gear, the following is a proper braking technique:

1. Apply the brakes just hard enough to feel a definite slowdown.
2. When your speed has been reduced to approximately 5 mph below your "safe" speed, release the brakes. This brake application should last for about three (3) seconds.
3. When your speed has increased to your "safe" speed, repeat steps 1 and 2.

For example, if your "safe" speed is 40 mph, you would not apply the brakes until your speed reaches 40 mph. You now apply the brakes hard enough to gradually reduce your speed to 35 mph and then release the brakes. Repeat this as often as necessary until you have reached the end of the downgrade.

Escape ramps have been built on many steep mountain downgrades. Escape ramps are made to stop runaway vehicles safely without injuring drivers and passengers. Escape ramps use a long bed of loose soft material to slow a runaway vehicle, sometimes in combination with an upgrade.

Know escape ramp locations on your route. Signs show drivers where ramps are located. Escape ramps save lives, equipment, and cargo. Use them if you lose your brakes.

2.15 SEEING HAZARDS

Importance of Seeing Hazards

What is a Hazard? A hazard is any road condition or other road user (driver, bicyclist, pedestrian) that is a possible danger. For example, a car in front of you is headed towards the freeway exit, but his brake lights come on and he begins braking hard. This could mean that the driver is uncertain about taking the off ramp. He might suddenly return to the highway. This car is a **hazard**. If the driver of the car cuts in front of you, it is no longer just a hazard; it is an emergency.

Seeing Hazards Lets You Be Prepared. You will have more time to act if you see hazards before they become emergencies. In the example above, you might make a lane change or slow down to prevent a crash if the car suddenly cuts in front of you. Seeing this hazard gives you time to check your mirrors and signal a lane change. Being prepared reduces the danger. A driver who did not see the hazard until the slow car pulled back on the highway in front of him would have to do something very suddenly. Sudden braking or a quick lane change is much more likely to lead to a crash.

Learning to See Hazards. There are often clues that will help you see hazards. The more you drive, the better you can get at seeing hazards. This section will talk about hazards that you should be aware of.

Hazardous Roads

Slow down and be very careful if you see any of the following road hazards.

Work Zones. When people are working on the road, it is a hazard. There may be narrower lanes, sharp turns, or uneven surfaces. Other drivers are often distracted and drive unsafely. Workers and construction vehicles may get in the way. Drive slowly and carefully near work zones. Use your 4-way flashers or brake lights to warn drivers behind you.

Drop Off. Sometimes the pavement drops off sharply near the edge of the road. Driving too near the edge can tilt your vehicle toward the side of the road. This can cause the top of your vehicle to hit roadside objects (signs, tree limbs). Also, it can be hard to steer as you cross the drop off, going off the road, or coming back on.

Foreign Objects. Things that have fallen on the road can be hazards. They can be a danger to your tires and wheel rims. They can damage electrical and brake lines. They can be caught between dual tires and cause severe damage. Some obstacles which appear to be harmless can be very dangerous. For example, cardboard boxes may be empty, but they may also contain some solid or heavy material capable of causing damage. The same is true of paper and cloth sacks. It is important to remain alert for objects of all sorts, so you can see them early enough to avoid them without making sudden, unsafe moves.

Off-ramps / On-ramps. Freeway and turnpike exits can be particularly dangerous for commercial vehicles. Off-ramps and on-ramps often have speed limit signs posted. Remember, these speeds may be safe for automobiles, **but may not be safe for larger vehicles or heavily loaded vehicles.** Exits which go downhill and turn at the same time can be especially dangerous. The downgrade makes it difficult to reduce speed. Braking and turning at the same time can be a dangerous practice. Make sure you are going slow enough before you get on the curved part of an off-ramp or on-ramp.

Drivers Who Are Hazards

In order to protect yourself and others, you must know when other drivers may do something hazardous. Some clues to this type of hazard are discussed below.

Blocked Vision. People who can't see others are a very dangerous hazard. Be alert for drivers whose vision is blocked. Vans, loaded station wagons, and cars with the rear window blocked are examples. Rental trucks should be watched carefully. Their drivers are often not used to the limited vision they have to the sides and rear of the truck. In winter, vehicles with frosted, ice covered, or snow covered windows are hazards.

Vehicles may be partly hidden by blind intersections or alleys. If you can only see the rear or front end of a vehicle but not the driver, then he or she can't see you. Be alert because he/she may back out or enter into your lane. Always be prepared to stop.

Delivery trucks can present a hazard. The driver's vision is often blocked by packages, or vehicle doors. Drivers of step vans, postal

vehicles, and local delivery vehicles often are in a hurry and may suddenly step out of their vehicle or drive their vehicle into the traffic lane.

Parked vehicles can be hazards when the occupants are exiting the vehicle. Or the parked vehicles may suddenly start up and drive into your way. Watch for movement inside the vehicle or movement of the vehicle itself that shows people are inside. Watch for brake lights or backup lights, exhaust, and other clues that a driver is about to move.

Be careful of a stopped bus. Passengers may cross in front of or behind the bus, and they often can't see you. Remember that all vehicles must stop for a school bus displaying flashing red signal lights.

Pedestrians and bicyclists can also be hazards. Walkers, joggers, and bicyclists may be on the road with their back to the traffic, so they can't see you. Sometimes, they wear portable stereos with head sets, so they can't hear you either. This can be dangerous. On rainy days, pedestrians may not see you because of hats or umbrellas. They may be hurrying to get out of the rain and may not pay attention to the traffic.

Distractions. People who are distracted are hazards. Watch for where they are looking. If they are looking elsewhere, they can't see you. But be alert even when they are looking at you. They may believe that they have the right of way.

Children. Children tend to act quickly without checking traffic. Children playing with one another may not look for traffic and are a serious hazard.

Talkers. Drivers or pedestrians talking to one another may not be paying close attention to the traffic.

Workers. People working on or near the roadway are a hazard clue. The work creates a distraction for other drivers and the workers themselves may not see you.

Ice Cream Truck. Someone selling ice cream is a hazard clue. Children may be nearby and may not see you.

Disabled Vehicle. Drivers changing a tire or fixing an engine often do not pay attention to the danger that roadway traffic is to them. They are often careless. Jacked up wheels or raised hoods are hazard clues.

Accidents. Accidents are particularly hazardous. People involved in the accident may not look for traffic. Passing drivers tend to look at the accident. People often run across the road without looking. Vehicles may slow or stop suddenly.

Shoppers. People in and around shopping areas are often not watching traffic because they are looking for stores or looking into store windows.

Confused Drivers. Confused drivers often change direction suddenly or stop without warning. Confusion is common near freeway or turnpike interchanges and major intersections. Tourists unfamiliar with the area can be very hazardous. Clues to tourists include car-top luggage and out-of-state license plates. Unexpected actions (stopping in the middle of a block, changing lanes for no apparent reason, backup lights suddenly going on) are clues to confusion. Hesitation is another clue, including driving very slowly, using brakes often, or stopping in the middle of an intersection. You may also see drivers who are looking at street signs, maps, and house numbers. These drivers may not be paying attention to you.

Slow Drivers. Motorists who fail to maintain normal speed are hazards. Seeing slow moving vehicles early can prevent a crash. Some vehicles, by their nature, are slow and seeing them is a hazard clue (mopeds, farm machinery, construction machinery, tractors, etc.). Some of these will have the "slow moving vehicle" symbol to warn you. This is a red triangle with an orange center. Watch for it.

Drivers signaling a turn may be a hazard. Drivers signaling a turn may slow more than expected or stop. If they are making a tight turn into an alley or driveway, they may go very slow. If they are blocked by pedestrians or other vehicles, they may have to stop on the roadway. Vehicles turning left may have to stop for oncoming vehicles.

Drivers in a Hurry. Drivers may feel your commercial vehicle is preventing them from getting where they want to go on time. Such drivers may pass you without a safe gap in the oncoming traffic, cutting too close in front of you. Drivers entering the road may pull in front of you in order to avoid being stuck behind you, causing you to brake. Be aware of this and watch for drivers who are in a hurry.

Impaired Drivers. Drivers who are sleepy, have had too much to drink, on drugs, or who are ill are hazards. Some clues to these drivers are:

- Weaving across the road or drifting from one side to another
- Leaving the road (dropping right wheels onto the shoulder, or bumping across a curb in a turn)
- Stopping at the wrong time (stopping at a green light, or waiting for too long at a stop)
- Open window in cold weather
- Speeds up or slows down suddenly, driving too fast or too slow.

Be alert for drunk drivers and sleepy drivers late at night.

Driver Body Movement As A Clue. Drivers look in the direction they are going to turn. You may sometimes get a clue from a driver's head and body movements that a driver may be going to make a turn even though the turn signals aren't on. Drivers making over-the-shoulder checks may be going to change lanes. These clues are most easily seen in motorcyclists and bicyclists. Watch other road users and try to tell whether they might do something hazardous.

Conflicts. You are in conflict when you have to change speed and/or direction to avoid hitting someone. Conflicts occur at intersections where vehicles meet, at merges (such as tumpike on ramps) and where there are needed lane changes (such as the end of a lane, forcing a move to another lane of traffic). Other situations include slow moving or stalled traffic in a traffic lane, and accident scenes. Watch for other drivers who are in conflict because they are a hazard to you. When they react to this conflict, they may do something that will put them in conflict with you.

Always Have a Plan

You should always be looking for hazards. Continue to learn to see hazards on the road. However, don't forget why you are looking for the hazards, they may turn into **emergencies**. You look for the hazards in order to have time to **plan a way out of any emergency**. When you see a hazard, think about the emergencies that could develop and figure out what you would do. Always be prepared to take action based on your plans. In this way, you will be a prepared, defensive driver who will improve not only your own safety but the safety of all road users.

Test Your Knowledge

1. What factors determine your selection of a "safe" speed when going down a long, steep downgrade?
2. Why should you be in the proper gear **before** starting down a hill?
3. Describe the proper braking technique when going down a long, steep downgrade.
4. What is a hazard?
5. Why make emergency plans when you see a hazard?

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.13 RAILROAD CROSSINGS, 2.14 MOUNTAIN DRIVING AND 2.15 SEEING HAZARDS.**

2.16 EMERGENCIES

Traffic emergencies occur when two vehicles are about to collide. **Vehicle** emergencies occur when tires, brakes, or other critical parts fail. Following the safety practices in this manual can help prevent emergencies. But if an emergency does happen, your chances of avoiding a crash depend upon how well you take action. Actions you can take are discussed below.

Steering to Avoid a Crash

Stopping is not always the safest thing to do in an emergency. When you don't have enough room to stop, you may have to steer away from what's ahead. Remember, you can almost always turn to miss an obstacle more quickly than you can stop. (However, top-heavy vehicles and tractors with multiple trailers may flip over.)

Keep Both Hands on the Steering Wheel. In order to turn quickly, you must have a firm grip on the steering wheel with both hands. The best way to have both hands on the wheel, if there is an emergency, is to keep them there all the time.

How to Turn Quickly and Safely. A quick turn can be made safely, if it's done the right way. Here are some points that safe drivers use:

- Do **not** apply the brake while you are turning. It's very easy to lock your wheels while turning. If that happens, you may skid out of control.
- Do **not** turn any more than needed to clear whatever is in your way. The more sharply you turn, the greater the chances of a skid or rollover.
- Be prepared to "counter-steer", that is, to turn the wheel back in the other direction, once you've passed whatever was in your path. Unless you are prepared to counter-steer, you won't be able to do it quickly enough. You should think of emergency steering and counter-steering as two parts of one driving action.

Where to Steer. If an oncoming driver has drifted into your lane, a move to your right is best. If that driver realizes what has happened, the natural response will be to return to his or her own lane.

If something is blocking your path, the best direction to steer will depend on the situation.

- If you have been using your mirrors, you'll know which lane is empty and can be safely used.
- If the shoulder is clear, going right may be best. No one is likely to be driving on the shoulder but someone may be passing you on the left. You will know if you have been using your mirrors.
- If you are blocked on both sides, a move to the right may be best. At least you won't force anyone into an opposing traffic lane and a possible head-on collision.

Leaving the Road. In some emergencies, you may have to drive off the road. It may be less risky than facing a collision with another vehicle.

Most shoulders are strong enough to support the weight of a large vehicle and, therefore, offer an available escape route. Here are some guidelines, if you do leave the road.

Avoid Braking. If possible, avoid using the brakes until your speed has dropped to about 20 mph. Then brake very gently to avoid skidding on a loose surface.

Keep one set of wheels on the pavement if possible. This helps to maintain control.

Stay on the Shoulder. If the shoulder is clear, stay on it until your vehicle has come to a stop. Signal and check your mirrors before pulling back onto the road.

Returning to the Road. If you are forced to return to the road before you can stop, use the following procedure:

- Hold the wheel tightly and turn sharply enough to get right back on the road safely. Don't try to edge gradually back on the road. If you do, your tires might grab unexpectedly and you could lose control.
- When both front tires are on the paved surface, **counter-steer** immediately. The two turns should be made as a single "steer counter-steer" move.

How to Stop Quickly and Safely

If somebody suddenly pulls out in front of you, your natural response is to hit the brakes. This is a good response if there's enough distance to stop and you use the brakes correctly.

You should brake in a way that will keep your vehicle in a straight line and allow you to turn if it becomes necessary. You can use the "controlled braking" method or the "stab braking" method.

Controlled Braking. With this method, you apply the brakes as hard as you can **without** locking the wheels. Keep steering wheel movements very small while doing this. If you need to make a larger steering adjustment or if the wheels lock, release the brakes. Re-apply the brakes as soon as you can.

Stab Braking. (Only on vehicles without anti-lock brake systems.)

- Apply your brakes all the way
- Release brakes when wheels lock up
- As soon as the wheels start rolling, apply the brakes fully again. (It can take up to one second for the wheels to start rolling after you release the brakes. If you re-apply the brakes before the wheels start rolling, the vehicle won't straighten out.)

Don't Jam on the Brakes. (Only on vehicles with anti-lock brake systems.) Emergency braking does not mean pushing down on the brake pedal as hard as you can. That will only keep the wheels locked up and cause a skid. If the wheels are skidding, you cannot control the vehicle.

SAFETY NOTE

If you drive a vehicle with anti-lock brakes, you should read and follow the directions found in the Owners Manual for stopping quickly.

Brake Failure

Brakes kept in good condition rarely fail. Most **hydraulic** brake failures occur for one of two reasons (air brakes are discussed in Section 5):

- Loss of hydraulic pressure

- Brake fade on long hills.

Loss of Hydraulic Pressure. When the system won't build up pressure, the brake pedal will feel spongy or go to the floor. Here are some things you can do.

Downshift. Putting the vehicle into a lower gear will help to slow the vehicle.

Pump the Brakes. Sometimes pumping the brake pedal will generate enough hydraulic pressure to stop the vehicle.

Use the Parking Brake. The parking or emergency brake is separate from the hydraulic brake system. Therefore, it can be used to slow the vehicle. However, be sure to press the release button or pull the release lever at the same time you use the emergency brake so you can adjust the brake pressure and keep the wheels from locking up.

Find an escape route. While slowing the vehicle, look for an escape route - an open field, side street, or escape ramp. Turning uphill is a good way to slow and stop the vehicle. Make sure the vehicle does not start rolling backward after you stop. Put it in low gear, apply the parking brake, and, if necessary, roll back into some obstacle that will stop the vehicle.

Brake Failure on Downgrades. Going slow enough and braking properly will almost always prevent brake failure on long downgrades. Once the brakes have failed, however, you are going to have to look outside your vehicle for something to stop it.

Your best hope is an **escape ramp**. If there is one, there will be signs telling you about it. Use it. Ramps are usually located a few miles from the top of the downgrade. Every year, hundreds of drivers avoid injury to themselves or damage to their vehicles by using escape ramps. Some escape ramps use soft gravel that resists the motion of the vehicle and brings it to a stop. Others turn uphill, using the hill to stop the vehicle and soft gravel to hold it in place.

Any driver who loses brakes going downhill should use an escape ramp if it's available. If you don't use it, your chances of having a serious crash may be much greater.

If no escape ramp is available, take the least hazardous escape route you can - such as an open field or a side road that flattens out or turns uphill. Make the move as soon as you know your brakes don't work. The longer you wait, the faster the vehicle will go and the harder it will be to stop.

Tire Failure

Recognize Tire Failure. Quickly knowing you have a tire failure will let you have more time to react. Having just a few seconds to remember what it is you're supposed to do can help you. The major signs of tire failure are:

Sound. The loud "bang" of a blowout is an easily recognized sign. Because it can take a few seconds for your vehicle to react, you

might think it was some other vehicle. But any time you hear a tire blow, you'd be safest to assume it was yours.

Vibration. If the vehicle thumps or vibrates heavily, it may be a sign that one of the tires has gone flat. With a rear tire, that may be the only sign you get.

Feel. If the steering feels "heavy", it is probably a sign that one of the front tires has failed. Sometimes, failure of a rear tire will cause the vehicle to slide back and forth or "fishtail." However, dual rear tires usually prevent this.

Any of these signs is a warning of possible tire failure. You should do the following things:

Hold the Steering Wheel Firmly. If a front tire fails, it can twist the steering wheel out of your hand. The only way to prevent this is to keep a firm grip on the steering wheel with both hands at all times.

Stay Off the Brake. It's natural to want to brake in an emergency. However, braking when a tire has failed could cause loss of control. Unless you're about to run into something, stay off the brake until the vehicle has slowed down. Then brake very gently, pull off the road, and stop.

Check the Tires. After you've come to a stop, get out and check all the tires. Do this even if the vehicle seems to be handling all right. If one of your dual tires goes, the only way you may know it is by getting out and looking at it.

2.17 SKID CONTROL AND RECOVERY

A skid happens whenever the tires lose their grip on the road. This is caused in one of four ways:

- **Over-braking.** Braking too hard and locking up the wheels. Skids also can occur when using the speed retarder when the road is slippery.
- **Over-steering.** Turning the wheels more sharply than the vehicle can turn.
- **Over-acceleration.** Supplying too much power to the drive wheels, causing them to spin.
- **Driving too fast.** Most serious skids result from driving too fast for road conditions. Drivers who adjust their driving to conditions don't over-accelerate and don't have to over-brake or over-steer from too much speed.

Drive-Wheel Skids

By far the most common skid is one in which the rear wheels lose traction through excessive braking or acceleration. Skids caused by acceleration usually happen on ice or snow. They can be easily stopped by taking your foot off the accelerator. (If it is very slippery, push the clutch in. Otherwise, the engine can keep the wheels from rolling freely and regaining traction.)

Rear wheel braking skids occur when the rear drive wheels lock. Because locked wheels have less traction than rolling wheels, the rear wheels usually slide sideways in an attempt to "catch up" with the front wheels. In a bus or straight truck, the vehicle will slide sideways in a "spin out." With vehicles towing trailers, a drive-wheel skid can let the trailer push the towing vehicle sideways, causing a sudden jackknife as shown in Figure 17.

Correcting a Drive-Wheel Braking Skid

Do the following to correct a drive-wheel braking skid:

- **Stop braking.** This will let the rear wheels roll again, and keep the rear wheels from sliding any further. If on ice, push in the clutch to let the wheels turn freely.
- **Turn quickly.** When a vehicle begins to slide sideways, **quickly** steer in the direction you want the vehicle to go—down the road. You must turn the wheel quickly.
- **Counter-steer.** As a vehicle turns back on course, it has a tendency to keep right on turning. Unless you turn the steering wheel quickly the other way, you may find yourself skidding in the opposite direction.

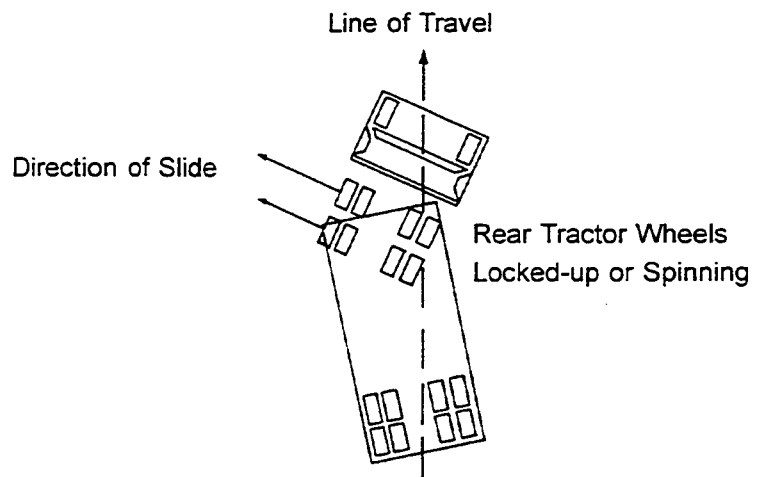
Learning to stay off the brake, turn the steering wheel quickly, push in the clutch, and counter-steer in a skid takes a lot of practice. The best place to get this practice is on a large driving range or "skid pad."

Front-Wheel Skids

Most front-wheel skids are caused by driving too fast for conditions. Other causes are: lack of tread on the front tires, and cargo loaded so not enough weight is on the front axle. In a front-wheel skid, the front end tends to go in a straight line regardless of how much you turn the steering wheel. On a very slippery surface, you may not be able to steer around a curve or turn.

When a front-wheel skid occurs, the only way to stop the skid is to let the vehicle slow down. Stop turning and/or braking so hard. Slow down as quickly as possible without skidding.

Figure 17: Tractor Jackknife



Test Your Knowledge

1. Stopping is not always the safest thing to do in an emergency. True or False?
2. What are some advantages of going right instead of left around an obstacle?
3. What is an "escape ramp?"
4. If a tire blows out, you should put the brakes on hard to stop quickly. True or False?

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.16 EMERGENCIES AND 2.17 SKID CONTROL AND RECOVERY.**

2.18 ACCIDENT PROCEDURES

When you're in an accident and not seriously hurt, you need to act to prevent further damage or injury. The basic steps to be taken at any accident are to:

- Protect the area
- Notify authorities
- Care for the injured.

Protect the Area

The first thing to do at an accident scene is to keep another accident from happening at the same spot. To protect the accident area:

- If your vehicle is involved in the accident, try to get it to the side of the road. This will help prevent another accident and allow traffic to move.
- If you're stopping to help, park away from the accident. The area immediately around the accident will be needed for emergency vehicles.
- Put on your flashers.
- Set out reflective triangles to warn other traffic. Make sure they can be seen by other drivers in time for them to avoid the accident.

Notify Authorities

If you have a CB, put out a call over the emergency channel before you get out of your vehicle. If not, wait until after the accident scene has been properly protected, then phone or send someone to phone the police. Try to determine where you are so you can give the exact location.

Care for the Injured

If a qualified person is at the accident and helping the injured, stay out of the way unless asked to assist. Otherwise, do the best you can to help any injured parties. Here are some simple steps to follow in giving assistance:

- Don't move a severely injured person unless the danger of fire or passing traffic makes it necessary.
- Stop heavy bleeding by applying direct pressure to the wound.
- Keep the injured person warm.

2.19 FIRES

Truck fires can cause damage and injury. Learn the causes of fires and how to prevent them. Know what to do to extinguish fires.

Causes of Fire

The following are some causes of vehicle fires:

- **After accidents.** Spilled fuel, improper use of flares.
- **Tires.** Under-inflated tires and duals that touch.
- **Electrical System.** Short circuits due to damaged insulation, loose connections.
- **Fuel.** Driver smoking, improper fueling, loose fuel connections.
- **Cargo.** Flammable cargo, improperly sealed or loaded, poor ventilation.

Fire Protection

Pay attention to the following:

Pre-Trip Inspection. Make a complete inspection of the electrical, fuel, and exhaust systems, tires, and cargo. Be sure to check that the fire extinguisher is charged.

En Route Inspection. Check the tires, wheels, and truck body for signs of heat whenever you stop during a trip.

Follow Safe Procedures. Follow correct safety procedures for fueling the vehicle, using brakes, handling flares, and other activities that can cause a fire.

Monitoring. Check the instruments and gauges often for signs of overheating and use the mirrors to look for signs of smoke from tires or the vehicle.

Caution. Use normal caution in handling anything flammable.

Fire Fighting

Knowing how to fight fires is important. Fires have been made worse by drivers who didn't know what to do. Know how the fire extinguisher works. Study the instructions printed on the extinguisher before you need it. Here are some procedures to follow in case of fire.

Pull Off the Road. The first step is to get the vehicle off the road and stop. In doing so:

- Park in an open area, away from buildings, trees, brush, other vehicles, or anything that might catch fire.
- Don't pull into a service station!
- Notify emergency services of your problem and your location.

Keep the Fire from Spreading. Before trying to put out the fire, make sure that it doesn't spread any further.

- With an **engine** fire, turn off the engine as soon as you can. Don't open the hood if you can avoid it. Shoot the extinguisher through louvers, radiator, or from the underside of the vehicle.
- For a **cargo** fire in a van or box trailer, keep the doors shut, especially if your cargo contains hazardous materials. Opening the van doors will supply the fire with oxygen and can cause it to burn very fast.

Use the Right Fire Extinguisher.

- The B:C type fire extinguisher is designed to work on electrical fires and burning liquids. The A:B:C type is designed to work on burning wood, paper, and cloth as well.
- Water can be used on wood, paper, or cloth, but don't use water on an electrical fire (you could get shocked) or a gasoline fire (it will just spread the flames).
- A burning tire must be cooled. Lots of water may be required.
- If you're not sure what to use, especially on a hazardous materials fire, wait for qualified fire fighters.

Extinguish the Fire. Here are some rules to follow in putting out a fire:

- Only try to extinguish a fire if you know what you are doing and it is safe to do so.
- When using the extinguisher, stay as far away from the fire as possible.
- Aim at the source or base of the fire, not up in the flames.
- Position yourself upwind. Let the wind carry the extinguisher to the fire rather than carrying the flames to you.
- Continue until whatever was burning has been cooled. Absence of smoke or flame does not mean the fire is completely out or cannot restart.

Test Your Knowledge

1. What are some things to do at an accident scene to prevent another accident?
2. Name two causes of tire fires.
3. What kinds of fires is a B:C extinguisher **not** good for?
4. When using your extinguisher, should you get as close as possible to the fire?
5. Name some causes of vehicle fires.

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.18 ACCIDENT PROCEDURES AND 2.19 FIRES.**

2.20 STAYING ALERT AND FIT TO DRIVE

Driving a vehicle for long hours is tiring. Even the best of drivers will become less alert. However, there are things that good drivers do to help stay alert and safe. Here are a few suggestions.

Be Ready to Drive

Get Enough Sleep. Leaving on a long trip when you're already tired is dangerous. If you have a long trip scheduled, make sure that you get enough sleep before you go. Most people require 7 - 8 hours of sleep every 24 hours.

Schedule Trips Safely. Your body gets used to sleeping during certain hours. If you are driving during those hours, you will be less alert. If possible, try to schedule trips for the hours you are normally awake. Many heavy motor vehicle accidents occur between midnight and 6 a.m. Tired drivers can easily fall asleep at these times, especially if they don't regularly drive at those hours. Trying to push on and finish a long trip at these times can be very dangerous.

Avoid Medication. Many medicines can make you sleepy. Those that do have a label warning against operating vehicles or machinery. The most common medicine of this type is an ordinary cold pill. If you have to drive with a cold, you are better off suffering from the cold than from the effects of the medicine.

Keep Cool. A hot, poorly ventilated cab can make you sleepy. Keep the window or vent cracked or use the air conditioner, if you have one.

Take Breaks. Short breaks can keep you alert. But the time to take them is **before** you feel really drowsy or tired. Stop often. Walk around and inspect your vehicle. It may help to do some physical exercises.

When You Do Become Sleepy

When you are sleepy, trying to "push on" is far more dangerous than most drivers think. It is a **major cause of fatal accidents**. Here are some important rules to follow.

Stop to Sleep. When your body needs sleep, sleep is the only thing that will work. If you have to make a stop anyway, make it whenever you feel the first signs of sleepiness, even if it is earlier than you planned. By getting up a little earlier the next day, you can keep on schedule without the danger of driving while you are not alert.

Take a Nap. If you can't stop for the night, at least pull off at a safe place, such as a rest area or truck stop, and take a nap. A nap as short as a half-hour will do more to overcome fatigue than a half-hour coffee stop.

Avoid Drugs. There are no drugs that can overcome being tired. While they may keep you awake for a while, they won't make you alert. And eventually, you'll be even more tired than if you hadn't taken them at all. Sleep is the only thing that can overcome fatigue.

Alcohol and Driving

Drinking alcohol and then driving is a very serious problem. People who drink alcohol are involved in traffic accidents resulting in over 20,000 deaths every year. You should know:

- How alcohol works in the human body
- How it affects driving
- Laws regarding drinking and driving
- Legal, financial, and safety risks of drinking and driving.

The Truth About Alcohol. There are many dangerous ideas about the use of alcohol. The driver who believes in these wrong ideas will be more likely to get into trouble. Here are some examples.

FALSE	THE TRUTH
Alcohol increases your ability to drive	Alcohol is a drug that will make you less alert and reduce your ability to drive safely
Some people can drink a lot and not be affected	Everyone who drinks is affected by alcohol
If you eat a lot first, you won't get drunk	Food will not keep you from getting drunk
Coffee and a little fresh air will help a drinker sober up	Only time will help a drinker sober up - other methods just don't work
Stick with beer - it's not as strong as wine or whiskey	A few beers are the same as a few shots of whiskey or a few glasses of wine

What is a Drink? It is the alcohol in drinks that affects human performance. It doesn't make any difference whether that alcohol comes from "a couple of beers" or from two glasses of wine or two shots of hard liquor.

All of the following drinks **contain the same amount of alcohol**:

- A 12 ounce glass of 5% beer
- A 5 ounce glass of 12% wine
- A 1 1/2 ounce shot of 80 proof liquor.

How Alcohol Works. Alcohol goes directly from the stomach into the blood stream. A drinker can control the amount of alcohol which he or she takes in, by having fewer drinks or none. However, the drinker cannot control how fast the body gets rid of alcohol. If you have drinks faster than the body can get rid of them, you will have more alcohol in your body and your driving will be more affected. The amount of alcohol in your body is commonly measured by the Blood Alcohol Concentration (BAC).

What Determines Blood Alcohol Concentration. BAC is determined by the amount of alcohol you drink (more alcohol means higher BAC), how fast you drink (faster drinking means higher BAC),

and your weight (a small person doesn't have to drink as much to reach the same BAC).

Alcohol and the Brain. Alcohol affects more and more of the brain as BAC builds up. The first part of the brain affected controls judgement and self-control. One of the bad things about this is it can keep drinkers from knowing they are getting drunk. And, of course, good judgement and self-control are absolutely necessary for safe driving.

As blood alcohol concentration continues to build up, muscle control, vision, and coordination are affected more and more. Eventually, a person will pass out.

How Alcohol Affects Driving. All drivers are affected by drinking alcohol. Alcohol affects judgement, vision, coordination, and reaction time. It causes serious driving errors, such as:

- Increased reaction time to hazards
- Driving too fast or too slow
- Driving in the wrong lane
- Running over the curb
- Weaving
- Straddling lanes
- Quick, jerky starts
- Not signaling, failure to use lights
- Running stop signs and red lights
- Improper passing.

These effects mean increased chances of a crash and chances of losing your driver's license. Accident statistics show that the chance of a crash is much greater for drivers who have been drinking than for drivers who were not.

Other Drugs

Besides alcohol, other legal and illegal drugs are being used more often. Laws prohibit possession or use of many drugs while on duty. They prohibit being under the influence of any "controlled substance"; an amphetamine (including "pep pills" and "bennies"), narcotics, or any other substance which can make the driver unsafe. This could include a variety of prescription and over-the-counter drugs (cold medicines) which may make the driver drowsy or otherwise affect safe driving ability. However, possession and use of a drug given to a driver by a doctor is permitted if the doctor informs the driver that it will not affect safe driving ability.

Pay attention to warning labels of legitimate drugs and medicines and to doctor's orders regarding possible effects. Stay away from illegal drugs. Don't use any drug that hides fatigue - the only cure for fatigue is rest. Alcohol can make the effects of other drugs much worse. The safest rule is don't mix drugs with driving at all.

Use of drugs can lead to traffic accidents resulting in death, injury, and property damage. Furthermore, it can lead to arrest, fines, and jail sentences. It can also mean the end of a person's driving career.

Illness

Once in a while, you may become so ill that you cannot operate a motor vehicle safely. If this happens to you, you must not drive. However, in case of an emergency you may drive to the nearest place where you can safely stop.

2.21 HAZARDOUS MATERIALS RULES FOR ALL DRIVERS

All drivers should know something about hazardous materials. You must be able to recognize hazardous cargo, and you must know whether or not you can haul it without having a Hazardous Materials endorsement to your CDL license.

What Are Hazardous Materials

Hazardous Materials are products that pose a risk to health, safety, and property during transportation. Figure 18 is the hazardous material table found in the federal rules. This table lists the 9 different hazard classes.

Figure 18: Hazardous Materials Hazard Class / Division Table

CLASS	DIVISION	NAME OF CLASS OR DIVISION	EXAMPLE
1	1.1	Mass Explosives	Dynamite
	1.2	Projection Hazards	Flares
	1.3	Mass Fire Hazards	Display Fireworks
	1.4	Minor Hazards	Ammunition
	1.5	Very Insensitive	Blasting Agents
	1.6	Extremely Insensitive	Explosive Devices
2	2.1	Flammable Gases	Propane
	2.2	Non-Flammable Gases	Helium
	2.3	Poisonous/Toxic Gases	Fluorine, Compressed
3	—	Flammable Liquids	Gasoline
4	4.1	Flammable Solids	Ammonium Picrate, Wetted
	4.2	Spontaneously Combustible	White Phosphorus
	4.3	Spontaneously Combustible When Wet	Sodium
5	5.1	Oxidizers	Ammonium Nitrate
	5.2	Organic Peroxides	Methyl Ethyl Ketone Peroxide
6	6.1	Poison (Toxic Material)	Potassium Cyanide
	6.2	Infectious Substances	Anthrax Virus
7	—	Radioactive	Uranium
8	—	Corrosives	Battery Fluid
9	—	Miscellaneous Hazardous Materials	Polychlorinated Biphenyls(PCB)
None	—	ORM-D (Other Regulated Material-Domestic)	Food Flavorings, Medicines
None	—	Combustible Liquids	Fuel Oil

Why Are There Rules?

You must follow the many rules about transporting them. The intent of the rules is to:

- Contain the product
- Communicate the risk
- Ensure safe drivers and equipment.

To Contain the Product. Many hazardous products can injure or kill on contact. To protect drivers and others from contact, the rules tell shippers how to package safely. Similar rules tell drivers how to load, transport, and unload bulk tanks. These are containment rules.

To Communicate the Risk. The shipper uses a shipping paper and package labels to warn dock workers and drivers of the risk.

The shipping paper describes the hazardous materials being transported. Shipping orders, bills of lading, and manifests are all shipping papers. Shippers put diamond shaped hazard warning labels on most hazardous materials packages. These labels inform others of the hazard. If the diamond label won't fit on the container, shippers put the label on a tag. For example, compressed gas cylinders that will not hold a label will have tags or decals. Labels look like the examples shown in Figure 19.

Figure 19: Examples of Hazardous Materials Labels



Location of Shipping Papers

After an accident or hazardous material spill or leak, you may be injured and unable to communicate the hazards of the materials you are transporting. Fire fighters and police can prevent or reduce the amount of damage or injury at the scene if they know what hazardous materials are being carried. Your life, and the lives of others, may depend on quickly locating the hazardous materials shipping papers. For that reason, you must tab shipping papers related to hazardous materials or keep them on top of other shipping papers. You must also keep shipping papers:

- In a pouch on the driver's door, or
- In clear view within reach while driving, or

Lists of Regulated Products

- On the driver's seat when out of the vehicle.

Placards are used to warn others of hazardous materials. Placards are signs put on the outside of a vehicle which identify the hazard class of the cargo. A placarded vehicle must have at least 4 identical placards. They are put on the front, rear, and both sides (see Figure 9-3 in the separate Hazardous Materials Sections booklet). Placards must be readable from all four directions. They are 10 3/4 inches square, turned upright on a point, in a diamond shape. Cargo tanks and other bulk packaging display the I.D. number of their contents on placards or orange panels.

Not all vehicles carrying hazardous materials need to have placards. The rules about placards are given in the separate Hazardous Materials Section booklet. You can drive a vehicle that carries hazardous materials if it does not require placards. If it requires placards, you must not drive it unless your driver's license has the hazardous materials endorsement.

To Ensure Safe Drivers and Equipment. The rules require all drivers of placarded vehicles to learn how to safely load and transport hazardous products. They must have a commercial driver's license with the hazardous materials endorsement.

To get the required endorsement you must pass a written test on material found in the separate Hazardous Materials Section booklet. You also will need a tank endorsement if you transport hazardous products in a cargo tank on a truck larger than 26,000 pounds, gross vehicle weight rating.

Drivers who need the hazardous materials endorsement must learn the placard rules. If you do not know if your vehicle needs placards, ask your employer. **Never drive a vehicle needing placards unless you have the hazardous materials endorsement.** To do so is a crime. When stopped, you will be cited and you will not be allowed to drive your truck further. It will cost you time and money. A failure to placard when needed will risk your life and others if you have an accident. Emergency help will not know of your hazardous cargo.

Hazardous materials drivers must also know which products they can load together, and which they can not. These rules are also in the separate Hazardous Materials Section booklet. Before loading a truck with more than one type of product, you must know if it is safe to load them together. If you do not know, ask your employer.

Test Your Knowledge

1. Common medicines for colds can make you sleepy. True or False?
2. What should you do if you do become sleepy while driving?
3. Coffee and a little fresh air will help a drinker sober up. True or False?
4. What is a hazardous materials placard?
5. Why are placards used?

These questions may be on the test. If you are unable to answer all of the questions, re-read **2.20 STAYING ALERT AND FIT TO DRIVE AND 2.21 HAZARDOUS MATERIALS RULES FOR ALL COMMERCIAL DRIVERS.**

SECTION 3: TRANSPORTING CARGO SAFELY

This Section Covers

Inspecting Cargo
Cargo Weight & Balance
Securing Cargo
Other Cargo Needing Care

Introduction

This section tells you about hauling cargo safely. You must understand basic cargo safety rules to get a CDL.

If you load cargo wrong or do not secure it, it can be a danger to others and yourself. Loose cargo that falls off a vehicle can cause traffic problems and others could be hurt or killed. Loose cargo could hurt or kill you during a quick stop or crash. Your vehicle could be damaged by an overload. Steering could be affected by how a vehicle is loaded, making it more difficult to control the vehicle.

Whether or not you load and secure the cargo yourself, you are responsible for:

- Inspecting your cargo.
- Recognizing overloads and poorly balanced weight.
- Knowing your cargo is properly secured.

These are discussed below.

If you intend to carry hazardous material that requires placards on your vehicle, you will also have to have a hazardous materials endorsement. You will find the information you need to get a Hazardous Materials endorsement in the separate Hazardous Materials Section booklet.

3.1 INSPECTING CARGO

Before Starting

As part of your pre-trip inspection, make sure the truck is not overloaded and the cargo is balanced and secured properly.

Inspect the cargo and its securing devices again within 25 miles after beginning a trip. Make any adjustments needed. Check the cargo and securing devices as often as necessary during a trip to keep the load secure. A good habit is to inspect again:

- After you have driven for 3 hours or 150 miles.
- After every break you take during driving.

Federal, state, and local regulations for commercial vehicle weight, securing cargo, covering loads, and where you can drive large vehicles vary from place to place. Know the rules where you will be driving.

3.2 WEIGHT & BALANCE

Definitions You Should Know

You are responsible for not being overloaded. Here are some definitions of weight you should know:

Gross vehicle weight (GVW). The total weight of a single vehicle plus its load.

Gross combination weight (GCW). The total weight of a powered unit plus trailer(s) plus the cargo.

Gross vehicle weight rating (GVWR). The maximum GVW specified by the manufacturer for a single vehicle plus its load.

Gross combination weight rating (GCWR). The maximum GCW specified by the manufacturer for a specific combination of vehicles plus its load.

Axle weight. The weight transmitted to the ground by one axle or one set of axles.

Tire load. The maximum safe weight a tire can carry at a specified pressure. This rating is stated on the side of each tire.

Suspension systems. Suspension systems have a manufacturer's weight capacity rating.

Coupling device capacity. Coupling devices are rated for the maximum weight they can pull and/or carry.

Legal Weight Limits

You must keep weights within legal limits. States have maximums for GVWs, GCWs and axle weights. Often, maximum axle weights are set by a bridge formula. A bridge formula permits less maximum axle weight for axles that are closer together. This is to prevent overloading bridges and roadways.

Overloading can have bad effects on steering, braking, and speed control. Overloaded trucks have to go very slow on upgrades. Worse, they may gain too much speed on downgrades. Stopping distance increases. Brakes can fail when forced to work too hard.

During bad weather or in mountains, it may not be safe to operate at legal maximum weights. Take this into account before driving.

Don't Be Top-Heavy

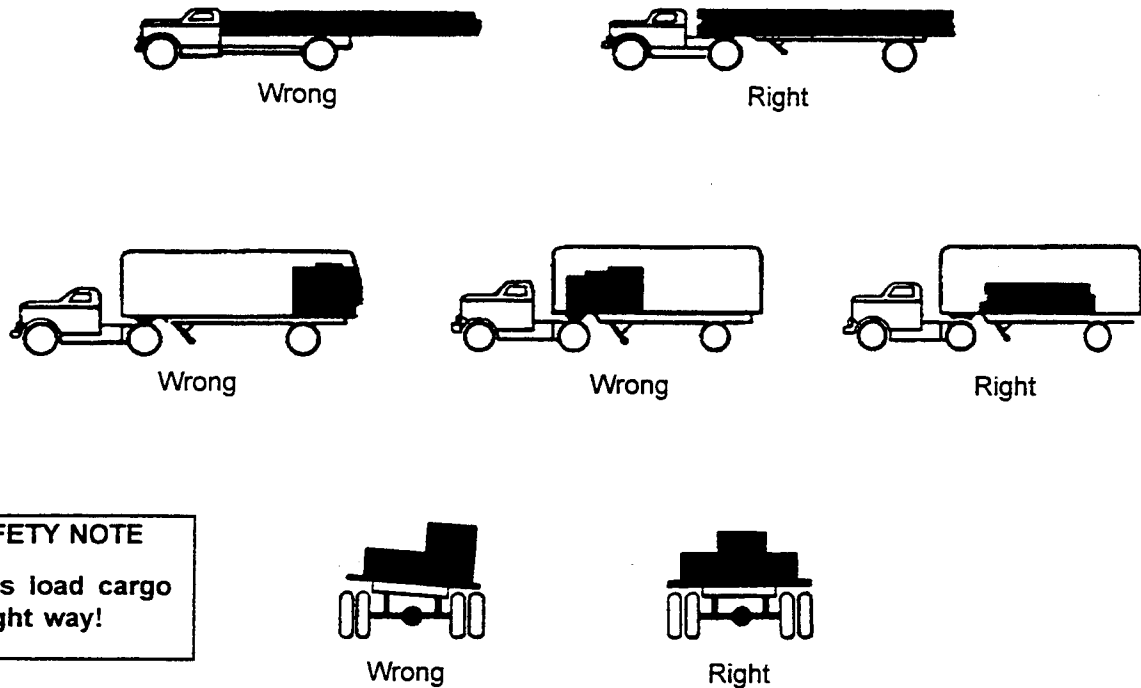
The height of the vehicle's center of gravity is very important for safe handling. A high center of gravity (cargo piled up high or heavy cargo on top) means you are more likely to tip over. It is most dangerous in curves or if you have to swerve to avoid a hazard. It is very important to distribute the cargo so it is as low as possible. Put the heaviest parts of the cargo under the lightest parts.

Balance the Weight

Poor weight balance can make vehicle handling unsafe. Too much weight on the steering axle can cause hard steering. It can damage the steering axle and tires. Under-loaded front axles (caused by

shifting weight too far to the rear) can make the steering axle weight too light to steer safely. Too little weight on the driving axles can cause poor traction. The drive wheels may spin easily. During bad weather, the truck may not be able to keep going. Weight that is loaded so there is a high center of gravity causes greater chance of rollover. On flat bed vehicles, there is also a greater chance that the load will shift to the side or fall off. Figure 20 shows examples of the right and wrong way to balance cargo weight.

Figure 20: Examples of Loading Cargo



Test Your Knowledge

1. For what three things related to cargo are drivers responsible?
2. How often must you stop while on the road to check your cargo?
3. How is **Gross Combination Weight Rating** different from **Gross Combination Weight**?
4. Name two situations where legal maximum weights may not be safe.
5. What can happen if you don't have enough weight on the front axle?

These questions may be on the test. If you are unable to answer all of the questions, re-read **3.1 INSPECTING CARGO AND 3.2 WEIGHT & BALANCE.**

3.3 SECURING CARGO

Blocking and Bracing

Blocking is used in the front, back, and/or sides of a piece of cargo to keep it from sliding. Blocking is shaped to fit snugly against cargo. It is secured to the cargo deck to prevent cargo movement. **Bracing** is also used to prevent movement of cargo. Bracing goes from the upper part of the cargo to the floor and/or walls of the cargo compartment.

Cargo Tiedown

On flatbed trailers or trailers without sides, cargo must be secured to keep it from shifting or falling off. In closed vans, tiedowns can also be important to prevent cargo shifting that may affect the handling of the vehicle. Tiedowns must be of the proper type and proper strength. The combined strength of all cargo tiedowns must be strong enough to lift one and one half times the weight of the piece of cargo tied down. Proper tiedown equipment must be used, including ropes, straps, chains, and tensioning devices (winches, ratchets, clinching components). Tiedowns must be attached to the vehicle correctly (hook, bolt, rails, rings).

Cargo should have at least one tiedown for each 10 feet of cargo. Make sure you have enough tiedowns to meet this need. No matter how small the cargo, it should have at least two tiedowns holding it.

There are special requirements for securing various heavy pieces of metal. Find out what they are if you are to carry such loads.

Header Boards

Front end header boards ("headache racks") protect you from your cargo in case of a crash or emergency stop. Make sure the front end structure is in good condition. The front end structure should block the forward movement of any cargo you carry.

Covering Cargo

There are two basic reasons for covering cargo, (1) to protect people from spilled cargo, and (2) to protect the cargo from weather. Spill protection is a safety requirement in many states. Be familiar with the laws in the states you drive in.

You should look at your cargo covers in the mirrors from time to time while driving. A flapping cover can tear loose, uncovering the cargo, and possibly block your view or someone else's.

Sealed & Containerized Loads

You cannot inspect sealed loads, but you should check that you don't exceed gross weight and axle weight limits.

Containerized loads generally are used when freight is carried part way by rail or ship. Delivery by truck occurs at the beginning and/or end of the journey. Some containers have their own tiedown devices or locks that attach directly to a special frame. Others have to be loaded onto flat bed trailers. They must be properly secured just like any other cargo.

3.4 OTHER CARGO NEEDING SPECIAL ATTENTION

Dry Bulk

Dry bulk tanks require special care because they often have a high center of gravity, and the load can shift. Be extremely cautious (slow and careful) going around curves and making sharp turns.

Hanging Meat

Hanging meat (suspended beef, pork, lamb) in a refrigerated truck can be a very unstable load with a high center of gravity. Particular caution is needed on sharp curves such as off-ramps and on-ramps. Go slow.

Livestock

Livestock can move around in a trailer, causing unsafe handling. With less than a full load, use false bulkheads to keep livestock bunched together. Even when bunched, special care is necessary because livestock can lean on curves. This shifts the center of gravity and makes rollover more likely.

Oversized Loads

Over length, over width, and/or over weight loads require special transit permits. Driving is usually limited to certain times. Special equipment may be necessary such as "wide load" signs, flashing lights, flags, etc. Such loads may require a police escort or pilot vehicles bearing warning signs and/or flashing lights. These special loads require special driving care.

Test Your Knowledge

1. What is the minimum number of tiedowns for any flat bed load?
2. What is the minimum number of tiedowns for a 20 ft. load?
3. Name the two basic reasons for covering cargo on an open bed.
4. What must you check before transporting a sealed load?

These questions may be on the test. If you are unable to answer all of the questions, re-read **3.3 SECURING CARGO AND 3.4 OTHER CARGO NEEDING SPECIAL ATTENTION.**

SECTION 4: TRANSPORTING PASSENGERS

This Section Covers

Definition of a Bus
Pre-trip Inspection
Loading
Safe Driving with Buses

Introduction

Bus drivers must have a commercial driver's license if they drive a vehicle designed to seat more than 15 persons, including the driver.

Bus drivers must have a passenger endorsement on their commercial driver's license. To get the endorsement you must pass a knowledge test on Sections 2 and 4 of this manual. (If your bus has air brakes, you must also pass a knowledge test on Section 5.) You must also pass the skills tests required for a passenger vehicle.

4.1 PRE-TRIP INSPECTION

Before driving your bus, you must be sure it is safe. You must review the inspection report made by the previous driver. Only if defects reported earlier have been certified as repaired or not needed to be repaired, should you sign the previous driver's report. This is your certification that the defects reported earlier have been fixed.

Vehicle Systems

Make sure these things are in good working order before driving:

- Service brakes, including air hose couplings (if your bus has a trailer or semi-trailer)
- Parking brake
- Steering mechanism
- Lights and reflectors
- Tires (front wheels must not have recapped or regrooved tires)
- Horn
- Windshield wiper or wipers
- Rear-vision mirror or mirrors
- Coupling devices (if present)
- Wheels and rims
- Emergency Equipment.

Access Doors & Panels

As you check the outside of the bus, close any open emergency exits. Also, close any open access panels (for baggage, restroom service, engine, etc.) before driving.

Bus Interior

People sometimes damage unattended buses. Always check the interior of the bus before driving to ensure rider safety. Aisles and stairwells should always be clear. The following parts of your bus must be in safe working condition:

- Each handhold and railing

- Floor covering
- Signaling devices, including the restroom emergency buzzer, if the bus has a restroom
- Emergency exit handles.

The seats must be safe for riders. All seats must be securely fastened to the bus.

Never drive with an open emergency exit door or window. The "Emergency Exit" sign on an emergency door must be clearly visible. If there is a red emergency door light, it must work. Turn it on at night or any other time you use your outside lights.

Roof Hatches

You may lock some emergency roof hatches in a partly open position for fresh air. Do not leave them open as a regular practice. Keep in mind the bus's higher clearance while driving with them open.

Make sure your bus has the fire extinguisher and emergency reflectors required by law. Connecticut school buses and Special Education vehicles must be equipped with first aid kits. The bus must also have spare electrical fuses, unless equipped with circuit breakers.

Use Your Seatbelt

The driver's seat must have a seat belt. Always use it for safety.

4.2 LOADING AND TRIP START

Do not allow riders to leave carry-on baggage in a doorway or aisle. There should be nothing in the aisle that might trip other riders. Secure baggage and freight in ways that avoid damage and:

- Allow the driver to move freely and easily.
- Allow riders to exit by any window or door in an emergency.
- Protect riders from injury if carry-ons fall or shift.

Hazardous Materials

Watch for cargo or baggage containing hazardous materials. Most hazardous materials cannot be carried on a bus.

The Federal Hazardous Materials Table shows which materials are hazardous. They pose a risk to health, safety, and property during transportation. The rules require shippers to mark containers of hazardous material with the material's name, ID number, and hazard label. There are 24 different 4 inch, diamond-shaped hazard labels which represent the 9 hazard classes. Examples of these can be found in Figure 21. Watch for the diamond-shaped labels. Do not transport any hazardous material unless you are sure the rules allow it.

Figure 21: Examples of Hazardous Materials Labels



Forbidden Hazardous Materials

Buses may carry small-arms ammunition labeled ORM-D, emergency hospital supplies, and drugs. You can carry small amounts of some other hazardous materials if the shipper cannot send them any other way. Buses must **never** carry:

- Class 2.3 poison **gas** and Class 6 **liquid** poison, tear gas, irritating materials
- More than 100 pounds of **solid** Class 6 poisons
- Explosives in the space occupied by people, except small arms ammunition
- Labeled radioactive materials in the space occupied by people
- More than 500 pounds total of allowed hazardous materials, and no more than 100 pounds of any one class.

Riders sometimes board a bus with an unlabeled hazardous material. They may not know it is unsafe. Do not allow riders to carry on common hazards such as car batteries or gasoline.

Standee Line

No rider may stand forward of the rear of the driver's seat. Buses designed to allow standing must have a 2 inch line on the floor or some other means of showing riders where they cannot stand. This is called the standee line. All standing riders must stay behind it.

At Your Destination

When arriving at the destination or intermediate stops announce:

- The location
- Reason for stopping
- Next departure time and
- Bus number.

Remind riders to take carry-ons with them if they get off the bus. If the aisle is on a lower level than the seats, remind riders of the step-down. It is best to tell them before coming to a complete stop.

Charter bus drivers should not allow riders on the bus until departure time. This will help prevent theft or vandalism of the bus.

Test Your Knowledge

1. Name some things to check in the interior of a bus during a pre-trip inspection.
2. What are some hazardous materials you **can** transport by bus?
3. What are some hazardous materials you **can't** transport by bus?
4. What is a standee line?

These questions may be on the test. If you are unable to answer all of the questions, re-read 4.1 PRE-TRIP INSPECTION AND 4.2 LOADING AND TRIP START.

4.3 ON THE ROAD

Passenger Supervision

Many charter and intercity carriers have passenger comfort and safety rules. Mention rules about smoking, drinking, or use of radio and tape players at the start of the trip. Explaining the rules at the start will help to avoid trouble later on.

While driving, scan the interior of your bus as well as the road ahead, to the sides, and to the rear. You may have to remind riders about rules, or to keep arms and heads inside the bus.

At Stops

Riders can stumble when getting on or off and when the bus starts or stops. Caution riders to watch their step when leaving the bus. Wait for them to sit down or brace themselves before starting. Starting and stopping should be as smooth as possible to avoid rider injury.

Occasionally, you may have a drunk or disruptive rider. You must ensure this rider's safety as well as that of others. Don't discharge such riders where it would be unsafe for them. It may be safer at the next scheduled stop or a well-lighted area where there are other people. Many carriers have guidelines for handling disruptive riders.

Common Accidents

The Most Common Bus Crashes. Bus crashes often happen at intersections. Use caution, even if a signal or stop sign controls other traffic. School and mass transit buses sometimes scrape off mirrors or hit passing vehicles when pulling out from a bus stop. Remember the clearance your bus needs, and watch for poles and tree limbs at stops. Know the size of the gap your bus needs to accelerate and merge with traffic. Wait for the gap to open before leaving the stop. Never assume other drivers will brake to give you room when you signal or start to pull out.

Speed on Curves

Crashes on curves that kill people and destroy buses result from excessive speed, often when rain or snow has made the road slippery. Every banked curve has a safe "design speed." In good weather, the posted speed is safe for cars but it may be too high for many buses. With good traction, the bus may roll over; with poor traction, it might slide off the curve. **Reduce speed for curves!** If your bus leans toward the outside on a banked curve, you are driving too fast.

Railroad Crossing Stops

Stop at RR Crossings. Stop your bus between 15 and 50 feet before railroad crossings. Listen and look in both directions for trains. You should open your forward door if it improves your ability to see or hear an approaching train. Before crossing after a train has passed, make sure there isn't another train coming in the other direction on other tracks. If your bus has a manual transmission, never change gears while crossing the tracks.

You do not have to stop, but must slow down and carefully check for other vehicles:

- At street car crossings
- At railroad tracks used only for industrial switching within a business district
- Railroad Crossings Stops
- Where a policeman or flagman is directing traffic
- If a traffic signal shows green, and
- At crossings marked as "exempt" or "abandoned."

The exception to the above is that all school buses must stop at railroad crossings.

Drawbridges

Stop at Drawbridges. Stop at drawbridges that do not have a signal light or traffic control attendant. Stop at least 50 feet before the draw of the bridge. Look to make sure the draw is completely closed before crossing. You do not need to stop, but must slow down and make sure it's safe, when:

- There is a traffic light showing green
- The bridge has an attendant or traffic officer that controls traffic whenever the bridge opens.

4.4 AFTER-TRIP VEHICLE INSPECTION

Inspect your bus at the end of each shift. If you work for an interstate carrier, you must complete a written inspection report for each bus driven. The report must specify each bus and list any defect that would affect safety or result in a breakdown. If there are no defects, the report should say so.

Riders sometimes damage safety-related parts such as hand-holds, seats, emergency exits, and windows. If you report this damage at the end of a shift, mechanics can make repairs before the bus goes out again. Mass transit drivers should also make sure passenger signaling devices and brake-door interlocks work properly.

4.5 PROHIBITED PRACTICES

Avoid fueling your bus with riders on board unless absolutely necessary. Never refuel in a closed building with riders on board.

Don't talk with riders, or engage in any other distracting activity, while driving.

Do not tow or push a disabled bus with riders aboard the vehicle, unless getting off would be unsafe. Only tow or push the bus to the nearest safe spot to discharge passengers. Follow your employer's guidelines on towing or pushing disabled buses.

4.6 USE OF BRAKE-DOOR INTERLOCKS

Urban mass transit coaches may have a brake and accelerator interlock system. The interlock applies the brakes and holds the throttle in idle position when the rear door is open. The interlock releases when you close the rear door. Do not use this safety feature in place of the parking brake.

Test Your Knowledge

1. Does it matter where you make a disruptive passenger get off the bus?
2. How far from a railroad crossing should you stop?
3. When must you stop before crossing a drawbridge?
4. Describe from memory the "prohibited practices" listed above.
5. The rear door of a transit bus has to be open to put on the parking brake. True or False?

These questions may be on the test. If you are unable to answer all of the questions, re-read **4.3 ON THE ROAD, 4.4 AFTER-TRIP VEHICLE INSPECTION, 4.5 PROHIBITED PRACTICES AND 4.6 USE OF BRAKE-DOOR INTERLOCKS.**

SECTION 5: AIR BRAKES

This Section Covers

Air Brake System Parts
Dual Air Brake Systems
Inspecting Air Brakes
Using Air Brakes

Introduction

This section tells you about air brakes. If you want to drive a truck or bus with air brakes, or pull a trailer with air brakes, you need to read this section. If you want to pull a trailer with air brakes, you also need to read Section 6: Combination Vehicles.

Air brakes use **compressed air** to make the brakes work. Air brakes are a good and safe way of stopping large and heavy vehicles, but the brakes must be well maintained and used properly.

Air brakes are really three different braking systems: service brake, parking brake, and emergency brake systems.

- The **service brake** system applies and releases the brakes when you use the brake pedal during normal driving.
- The **parking brake** system applies and releases the parking brakes when you use the parking brake control.
- The **emergency brake** system uses parts of the service and parking brake systems to stop the vehicle in the event of a brake system failure.

The parts of these systems are discussed in greater detail below.

5.1 THE PARTS OF AN AIR BRAKE SYSTEM

There are many parts to an air brake system. You should know about the parts discussed here.

Air Compressor

The air compressor pumps air into the air storage tanks (reservoirs). The air compressor is connected to the engine through gears or a V-belt. The compressor may be air cooled or may be cooled by the engine cooling system. It may have its own oil supply, or be lubricated by engine oil. If the compressor has its own oil supply, check the oil level before driving.

Air Compressor Governor

The governor controls when the air compressor will pump air into the air storage tanks. When air tank pressure rises to the "cut-out" level (around 125 pounds per square inch or "psi"), the governor stops the compressor from pumping air. When the tank pressure falls to the "cut-in" pressure (around 100 psi), the governor allows the compressor to start pumping again.

Air Storage Tanks

Air storage tanks are used to hold compressed air. The number and size of air tanks varies among vehicles. The tanks will hold enough air to allow the brakes to be used several times even if the compressor stops working.

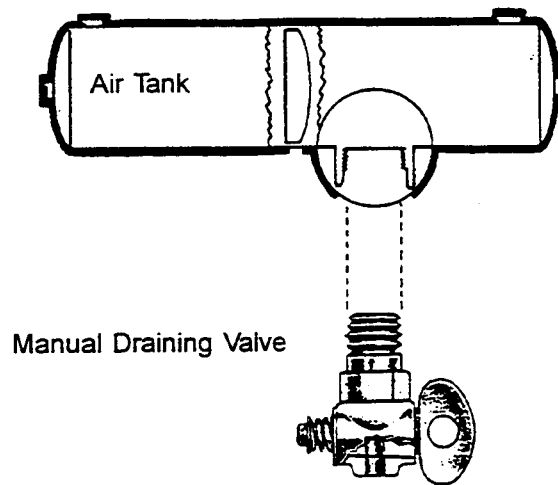
Air Tank Drains

Compressed air usually has some water and some compressor oil in it which is bad for the air brake system. For example, the water can freeze in cold weather and cause brake failure. The water and oil tend to collect in the bottom of the air tank. Be sure that you drain the air tanks completely. Each air tank is equipped with a drain valve in the bottom. There are two types:

- Manually operated by turning a quarter turn, shown in Figure 22, or by pulling a cable. You must drain the tanks yourself at the end of each day of driving.
- Automatic - the water and oil is automatically expelled. They may be equipped for manual draining as well.

The automatic types are available with electric heating devices. These help prevent freeze up of the automatic drain in cold weather.

Figure 22: Manual Drain Valve



Alcohol Evaporator

Some air brake systems have an alcohol evaporator to put alcohol into the air system. This helps to reduce the risk of ice in air brake valves and other parts during cold weather. Ice inside the system can make the brakes stop working.

Check the alcohol container and fill up as necessary, every day during cold weather. **Daily air tank drainage is still needed to get rid of water and oil.** (Unless the system has automatic drain valves.)

Safety Valve

A safety relief valve is installed in the first tank the air compressor pumps air to. The safety valve protects the tank and the rest of the system from too much pressure. The valve is usually set to open at 150 psi. If the safety valve releases air, something is wrong. Have the fault fixed by a mechanic.

Brake Pedal

You put on the brakes by pushing down the brake pedal. (It is also called the foot valve or treadle valve.) Pushing the pedal down

harder applies more air pressure. Letting up on the brake pedal reduces the air pressure and releases the brakes. Releasing the brakes lets some compressed air go out of the system, so the air pressure in the tanks is reduced. It must be made up by the air compressor. Pressing and releasing the pedal unnecessarily can let air out faster than the compressor can replace it. If the pressure gets too low, the brakes won't work.

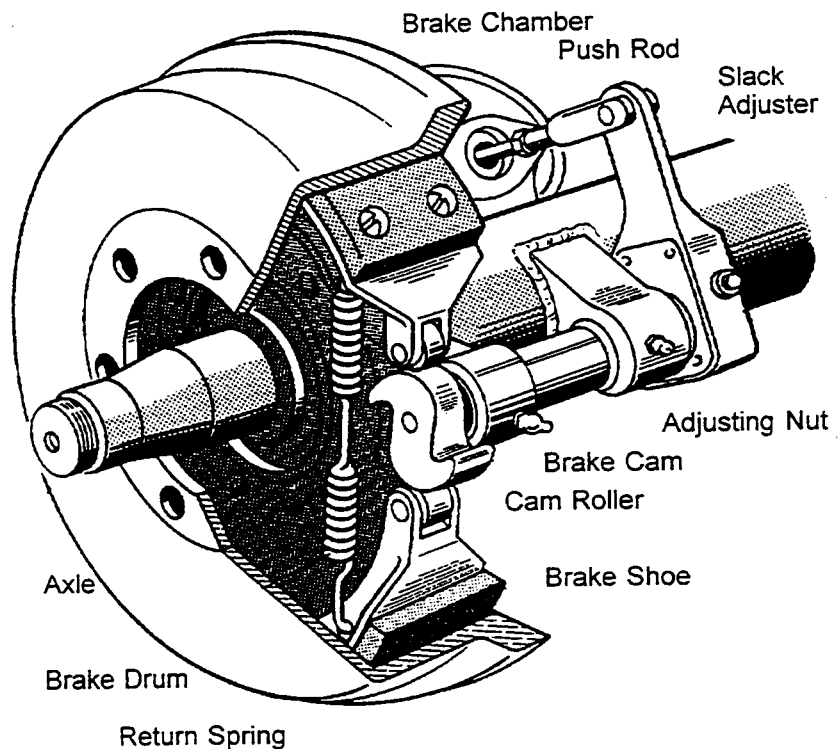
Foundation Brakes

Foundation brakes are used at each wheel. The most common type is the S-cam drum brake, shown in Figure 23. The parts of the brake are discussed below:

Brake drums, shoes, and linings. Brake drums are located on each end of the vehicle's axles. The wheels are bolted to the drums. The braking mechanism is inside the drum. To stop, the brake shoes and linings are pushed against the inside of the drum. This causes friction which slows the vehicle (and creates heat). The heat a drum can take without damage depends on how hard and how long the brakes are used. Too much heat can make the brakes stop working.

S-Cam Brakes. When you push the brake pedal, air is let into each brake chamber as shown in Figure 23. Air pressure pushes the rod out, moving the slack adjuster, thus twisting the brake cam shaft. This turns the S-cam (so called because it is shaped like the letter "S"). The S-cam forces the brake shoes away from one another and presses them against the inside of the brake drum. When you release the brake pedal, the S-cam rotates back and a spring pulls the brake shoes away from the drum, letting the wheels roll freely again.

Figure 23: S-Cam Air Brakes



Wedge Brakes. In this type brake, the brake chamber push rod pushes a wedge directly between the ends of two brake shoes. This shoves them apart and against the inside of the brake drum. Wedge brakes may have a single brake chamber, or two brake chambers, pushing wedges in at both ends of the brake shoes. Wedge type brakes may be self-adjusting or may require manual adjustment.

Disc Brakes. In air-operated disc brakes, air pressure acts on a brake chamber and slack adjuster, like S-cam brakes. But instead of the S-cam, a "power screw" is used. The pressure of the brake chamber on the slack adjuster turns the power screw. The power screw clamps the disc or rotor between the brake lining pads of a caliper, similar to a large C-clamp.

Wedge brakes and disc brakes are less common than S-cam brakes.

Supply Pressure Gauges

All air-braked vehicles have a pressure gauge connected to the air tank. If the vehicle has a dual air brake system, there will be a gauge for each half of the system. (Or a single gauge with two needles.) Dual systems will be discussed later. These gauges tell you how much pressure is in the air tanks.

Application Pressure Gauge

This gauge shows how much air pressure you are applying to the brakes. (This gauge is not on all vehicles.) Increasing application pressure to hold the same speed means the brakes are fading. You should slow down and use a lower gear. The need for increased pressure can also be caused by brakes out of adjustment, air leaks, or mechanical problems.

Low Air Pressure Warning

A low air pressure warning signal is required on vehicles with air brakes. A warning signal you can see must come on before the air pressure in the tanks falls below 60 psi. (Or one half the compressor governor cutout pressure on older vehicles.) The warning is usually a red light. A buzzer may also come on.

Another type of warning is the "wig wag." This device drops a mechanical arm into your view when the pressure in the system drops below 60 psi. An automatic wig wag will rise out of your view when the pressure in the system goes above 60 psi. The manual reset type must be placed in the "out of view" position manually. It will not stay in place until the pressure in the system is above 60 psi.

On large buses it is common for the low pressure warning devices to signal at 80-85 psi.

Stop Light Switch

Drivers behind you must be warned when you put your brakes on. The air brake system does this with an electric switch that works by air pressure. The switch turns on the brake lights when you put on the air brakes.

Front Brake Limiting Valve

Some older vehicles (made before 1975) have a front brake limiting valve and a control in the cab. The control is usually marked "normal" and "slippery." When you put the control in the "slippery" position, the limiting valve cuts the "normal" air pressure to the front brakes by half. Limiting valves were used to reduce the chance of the front wheels skidding on slippery surfaces. However, they

actually reduce the stopping power of the vehicle. Front wheel braking is good under all conditions. Tests have shown front wheel skids from braking are not likely even on ice. **Make sure the control is in the "normal" position to have normal stopping power.**

Many vehicles have automatic front wheel limiting valves. They reduce the air to the front brakes except when the brakes are put on very hard (60 psi or more application pressure). These valves cannot be controlled by the driver.

Spring Brakes

All trucks, truck tractors, and buses must be equipped with emergency brakes and parking brakes. They must be held on by mechanical force (because air pressure can eventually leak away). Spring brakes are usually used to meet these needs. When driving, powerful springs are held back by air pressure. If the air pressure is removed, the springs put on the brakes. A parking brake control in the cab allows the driver to let the air out of the spring brakes. This lets the springs put the brakes on. A leak in the air brake system which causes all the air to be lost will also cause the springs to put on the brakes.

Tractor and straight truck spring brakes will come fully on when air pressure drops to a range of 20 to 45 psi (typically 20 to 30 psi). Do not wait for the brakes to come on automatically. When the low air pressure warning light and buzzer first come on, bring the vehicle to a safe stop right away, while you can still control the brakes.

The braking power of spring brakes depends on the brakes being in adjustment. If the brakes are not adjusted properly, neither the regular brakes nor the emergency/parking brakes will work right.

Parking Brake Controls

In newer vehicles with air brakes, you put on the parking brakes using a **diamond-shaped, yellow, push-pull control knob**. You pull the knob out to put the parking brakes (spring brakes) on, and push it in to release them. On older vehicles, the parking brakes may be controlled by a lever. Use the parking brakes whenever you park.

Caution. Never push the brake pedal down when the spring brakes are on. If you do, the brakes could be damaged by the combined forces of the springs and the air pressure. Many brake systems are designed so this will not happen. But not all systems are set up that way, and those that are may not always work. It is much better to develop the habit of not pushing the brake pedal down when the spring brakes are on.

Modulating Control Valves. In some vehicles a control handle on the dash board may be used to apply the spring brakes gradually. This is called a modulating valve. It is spring loaded so you have a feel for the braking action. The more you move the control lever, the harder the spring brakes come on. They work this way so you can control the spring brakes if the service brakes fail. When parking a vehicle with a modulating control valve, move the lever as far as it will go and hold it in place with the locking device.

Dual Parking Control Valves. When main air pressure is lost, the spring brakes come on. Some vehicles, such as buses, have a

separate air tank which can be used to release the spring brakes. This is so you can move the vehicle in an emergency. One of the valves is a push-pull type and is used to put on the spring brakes for parking. The other valve is spring loaded in the "out" position. When you push the control in, air from the separate air tank releases the spring brakes so you can move. When you release the button, the spring brakes come on again. There is only enough air in the separate tank to do this a few times. Therefore, plan carefully when moving. Otherwise, you may be stopped in a dangerous location when the separate air supply runs out.

Test Your Knowledge

1. Why must air tanks be drained?
2. What is a supply pressure gauge used for?
3. All vehicles with air brakes must have a low air pressure warning signal. True or False?
4. What are spring brakes?
5. Front wheel brakes are good under all conditions. True or False?

These questions may be on the test. If you are unable to answer all of the questions, re-read
5.1 THE PARTS OF AN AIR BRAKE SYSTEM.

5.2 DUAL AIR BRAKE

Most newer heavy-duty vehicles use dual air brake systems for safety. A dual air brake system has two separate air brake systems which use a single set of brake controls. Each system has its own air tanks, hoses, lines, etc. One system typically operates the regular brakes on the rear axle or axles. The other system operates the regular brakes on the front axle (and possibly one rear axle). Both systems supply air to the trailer (if there is one). The first system is called the "primary" system. The other is called the "secondary" system.

Before driving a vehicle with a dual air system, allow time for the air compressor to build up a minimum of 100 psi pressure in both the primary and secondary systems. Watch the primary and secondary air pressure gauges (or needles, if the system has two needles in one gauge). Pay attention to the low air pressure warning light and buzzer. The warning light and buzzer should shut off when air pressure in both systems rises to a value set by the manufacturer. This value must be greater than 60 psi.

The warning light and buzzer should come on before the air pressure drops below 60 psi in either system. If this happens while driving, you should stop right away and safely park the vehicle. If one air system is very low on pressure, either the front or the rear brakes will not be operating fully. This means it will take you longer to stop. Bring the vehicle to a safe stop and have the air brakes system fixed.

5.3 INSPECTING AIR BRAKE SYSTEMS

You should use the basic seven-step inspection procedure described in Section 2 to inspect your vehicle. There are more things to inspect on a vehicle with air brakes than one without them. We discuss these things below, in the order that they fit into the seven-step method.

During Step 3: Engine Compartment Checks

Check Air Compressor Drive Belt (if compressor is belt driven). If the air compressor is belt-driven, check the condition and tightness of the belt. The belt should be in good condition.

During Step 5: Walkaround Inspecting

Check Manual Slack Adjusters on S-Cam Brakes. Park on level ground and chock the wheels to prevent the vehicle from moving. Turn off the parking brakes so you can move the slack adjusters. Use gloves and pull hard on each slack adjuster that you can get to. If a slack adjuster moves more than about one inch where the push rod attaches to it, it probably needs adjustment. Adjust it or have it adjusted. Vehicles with too much brake slack can be very hard to stop. Out-of-adjustment brakes are the most common problem found in roadside inspections. Be safe. Check the slack adjusters.

Check Brake Drums (or Discs), Linings, and Hoses. Brake drums (or discs) must not have cracks longer than one half the width of the friction area. Linings (friction material) must not be loose or soaked with oil or grease. They must not be dangerously thin. Mechanical parts must be in place, not broken or missing. Check the air hoses connected to the brake chambers to make sure they aren't cut or worn due to rubbing.

During Step 4: Start Engine and Inspect Inside Cab

Do the following checks instead of the test for hydraulic leaks as described in Section Two "Step 4: Start Engine and Inspect Inside Cab".

Test Low Pressure Warning Signal. Shut the engine off when you have enough air pressure so that the low pressure warning signal is not on. Turn the electrical power on and step on and off the brake pedal to reduce air tank pressure. The low air pressure warning signal must come on before the pressure drops to less than 60 psi in the air tank (or tank with the lowest air pressure, in dual air systems).

If the warning signal doesn't work, you could lose air pressure and you would not know it. This could cause sudden emergency braking in a single circuit air system. In dual systems the stopping distance

will be increased. Only limited braking can be done before the spring brakes come on.

Check that the Spring Brakes Come on Automatically. Chock the wheels, release the parking brakes when you have enough air pressure to do it, and shut the engine off. Step on and off the brake pedal to reduce the air tank pressure. The "parking brake" knob should pop out when the air pressure falls to the manufacturer's specification (usually in a range between 20-40 psi). This causes the spring brakes to come on.

Check Rate of Air Pressure Buildup. When the engine is at operating RPM, the pressure should build from 85 to 100 psi within 45 seconds in dual air systems. (If the vehicle has larger than minimum air tanks, the buildup time can be longer and still be safe. Check the manufacturer's specifications.) In single air systems (pre-1975), typical requirements are pressure buildup from 50 to 90 psi within 3 minutes with the engine at an idle speed of 600-900 RPM.

If air pressure does not build up fast enough, your pressure may drop too low during driving, requiring an emergency stop. Don't drive until you get the problem fixed.

Test Air Leakage Rate. With a fully-charged air system (typically 125 psi), turn off the engine, release the service brake, and time the air pressure drop. The loss rate should be less than 2 psi in one minute for single vehicles and less than 3 psi in one minute for combination vehicles. Then apply 90 psi or more with the brake pedal. After the initial pressure drop, if the air pressure falls more than 3 psi in one minute for single vehicles (more than 4 psi for combination vehicles), the air loss rate is too much. Check for air leaks and fix before driving the vehicle. Otherwise, you could lose your brakes while driving.

Check Air Compressor Governor Cut-in and Cut-out Pressures. Pumping by the air compressor should start at about 100 psi and stop at about 125 psi. (Check manufacturer's specifications.) Run the engine at a fast idle. The air governor should cut-out the air compressor at about the manufacturer's specified pressure. The air pressure shown by your gauge(s) will stop rising. With the engine idling, step on and off the brake to reduce the air tank pressure. The compressor should cut-in at about the manufacturer's specified cut-in pressure. The pressure should begin to rise.

If the air governor does not work as described above, it may need to be fixed. A governor that does not work properly may not keep enough air pressure for safe driving.

Test Parking Brake. Stop the vehicle, put the parking brake on, and gently pull against it in a low gear to test that the parking brake will hold.

Test Service Brakes. Wait for normal air pressure, release the parking brake, move the vehicle forward slowly (about 5 mph), and apply the brakes firmly using the brake pedal. Note any vehicle "pulling" to one side, unusual feel, or delayed stopping action.

This test may show you problems which you otherwise wouldn't know about until you needed the brakes on the road.

Test Your Knowledge

1. What is a dual air brake system?
2. What are the slack adjusters?
3. How can you check slack adjusters?
4. How can you test the low pressure warning signal?
5. What can you check that the spring brakes come on automatically?
6. What are the maximum leakage rates?

These questions may be on the test. If you are unable to answer all of the questions, re-read 5.2 DUAL AIR BRAKE AND 5.3 INSPECTING AIR BRAKE SYSTEMS.

5.4 USING AIR BRAKES

Normal Stops

Push the brake pedal down. Control the pressure so the vehicle comes to a smooth, safe stop. If you have a manual transmission, don't push the clutch in until the engine RPM is down close to idle. When stopped, select a starting gear.

Emergency Stops

If somebody suddenly pulls out in front of you, your natural response is to hit the brakes. This is a good response if there's enough distance to stop and you use the brakes correctly.

You should brake in a way that will keep your vehicle in a straight line and allow you to turn if it becomes necessary. You can use the "controlled braking" method or the "stab braking" method.

Controlled Braking. With this method, you apply the brakes as hard as you can **without** locking the wheels. Keep steering wheel movements very small while doing this. If you need to make a larger steering adjustment or if the wheels lock, release the brakes. Re-apply the brakes as soon as you can.

Stab Braking. (Only on vehicles without anti-lock brake systems.)

- Apply your brakes all the way.
- Release brakes when wheels lock up.

- As soon as the wheels start rolling, apply the brakes fully again. (It can take up to one second for the wheels to start rolling after you release the brakes. If you re-apply the brakes before the wheels start rolling, the vehicle won't straighten out.)

SAFETY NOTE

If you drive a vehicle with anti-lock brakes, you should read and follow the directions found in the Owner's Manual for stopping quickly.

Stopping Distance

We talked about stopping distance in Section 2 under "Speed and Stopping Distance." With air brakes there is an added delay: the time required for the brakes to work after the brake pedal is pushed. With hydraulic brakes (used on cars and light/medium trucks), the brakes work instantly. However, with air brakes, it takes a little time (one half second or more) for the air to flow through the lines to the brakes. Thus, the total stopping distance for vehicles with air brake systems is made up of **four** different factors.

Perception Distance

+ Reaction Distance

+ Brake Lag Distance

+ Braking Distance

= Total Stopping Distance

The air brake lag distance at 55 mph on dry pavement adds about 32 feet. So at 55 mph for an average driver under good traction and brake conditions, the total stopping distance is over 300 feet. This is longer than a football field.

Brake Fading or Failure

Brakes are designed so brake shoes or pads rub against the brake drum or disks to slow the vehicle. Braking creates heat, but brakes are designed to take a lot of heat. However, brakes can fade or fail from excessive heat caused by using them too much and not relying on the engine braking effect.

Excessive use of the service brakes results in overheating and leads to brake fade. Brake fade results from excessive heat causing chemical changes in the brake lining which reduces friction and also causes expansion of the brake drums. As the overheated drums expand, the brake shoes and linings have to move farther to contact the drums, and the force of this contact is also reduced. Continued overuse may increase brake fade until the vehicle cannot be slowed down or stopped at all.

Brake fade is also affected by adjustment. To safely control a vehicle, every brake must do its share of the work. Brakes out of adjustment will stop doing their share before those that are in adjustment. The other brakes can then overheat and fade and there will not be sufficient braking available to control the vehicle(s).

Brakes can get out of adjustment quickly, especially when they are hot. Therefore, brake adjustment must be checked frequently.

Proper Braking Technique

Remember: The use of brakes on a long and/or steep downgrade is only a supplement to the braking effect of the engine. Once the vehicle is in the proper low gear, the following is the proper braking technique:

- Apply the brakes just hard enough to feel a definite slowdown.
- When your speed has been reduced to approximately 5 mph below your "safe" speed, release the brakes. [This brake application should last for about three (3) seconds.]
- When your speed has increased to your "safe" speed, repeat steps 1 and 2.

For example, if your "safe" speed is 40 mph, you would not apply the brakes until your speed reaches 40 mph. You now apply the brakes hard enough to gradually reduce your speed to 35 mph and then release the brakes. Repeat this as often as necessary until you have reached the end of the downgrade.

Low Air Pressure

If the low air pressure warning comes on, **stop and safely park your vehicle as soon as possible.** There might be an air leak in the system. Controlled braking is possible only while enough air remains in the air tanks. The spring brakes will come on when the air pressure drops into the range of 20 to 45 psi. A heavily loaded vehicle will take a long distance to stop because the spring brakes do not work on all axles. Lightly loaded vehicles or vehicles on slippery roads may skid out of control when the spring brakes come on. It is much safer to stop while there is enough air in the tanks to use the foot brakes.

Parking Brakes

Any time you park, use the parking brakes, except as noted below. Pull the parking brake control knob out to apply the parking brakes, push it in to release them. The control will be a yellow, diamond-shaped knob labeled "parking brakes" on newer vehicles. On older vehicles, it may be a round blue knob or some other shape (including a lever that swings from side to side or up and down).

Don't use the parking brakes if the brakes are very hot (from just having come down a steep grade), or if the brakes are very wet in freezing temperatures. If they are used while they are very hot, they can be damaged by the heat. If they are used in freezing temperatures when the brakes are very wet, they can freeze so the vehicle can not move. Use wheel chocks to hold the vehicle. Let hot brakes cool before using the parking brakes. If the brakes are wet, use the brakes lightly while driving in a low gear to heat and dry them.

If your vehicle does not have automatic air tank drains, drain your air tanks at the end of each working day to remove moisture and oil. Otherwise, the brakes could fail.

SAFETY NOTE

Never leave your vehicle unattended without applying the parking brakes or chocking the wheels. Your vehicle might roll away and cause injury and damage.

Test Your Knowledge

1. Why should you be in the proper gear **before** starting down a hill?
2. What factors can cause brakes to fade or fail?
3. The use of brakes on a long steep downgrade is only a supplement to the braking effect of the engine. True or False?
4. If you are away from your vehicle only a short time, you don't need to use the parking brake. True or False?
5. How often should you drain air tanks?

These questions may be on the test. If you are unable to answer all of the questions, re-read **5.4 USING AIR BRAKES.**

SECTION 6: COMBINATION VEHICLES

This Section Covers

Driving Combinations
Combination Vehicle Air Brakes
Inspecting Combinations

Introduction

This section provides information needed to pass the tests for combination vehicles (tractor-trailer, doubles, triples, straight truck and trailer). The information is only to give you the minimum knowledge needed for driving common combination vehicles. You should also study Section 7 if you need to pass the tests for doubles-triples.

6.1 DRIVING COMBINATION VEHICLES SAFELY

Combination vehicles are usually heavier, longer, and require more driving skill than single commercial vehicles. This means that drivers of combination vehicles need more knowledge and skill than drivers of single vehicles. In this section, we talk about some important safety factors that apply specifically to combination vehicles.

Rollover Risks

More than half of truck driver deaths in crashes are the result of truck rollovers. When more cargo is piled up in a truck, the "center of gravity" moves higher up from the road. The truck becomes easier to turn over. Fully loaded rigs are 10 times more likely to roll over in a crash than empty rigs.

The following two things will help you prevent rollover: **Keep the cargo as close to the ground as possible, and drive slowly around turns.** Keeping cargo low is even more important in combination vehicles than in straight trucks. Also, keep the load centered on your rig. If the load is to one side so it makes a trailer lean, a rollover is more likely. Make sure your cargo is centered and spread out as much as possible. (Cargo distribution is covered in Section 3 of this manual.)

Rollovers happen when you turn too fast. Drive slowly around corners, on ramps, and off ramps. Avoid quick lane changes, especially when fully loaded.

Steer Gently

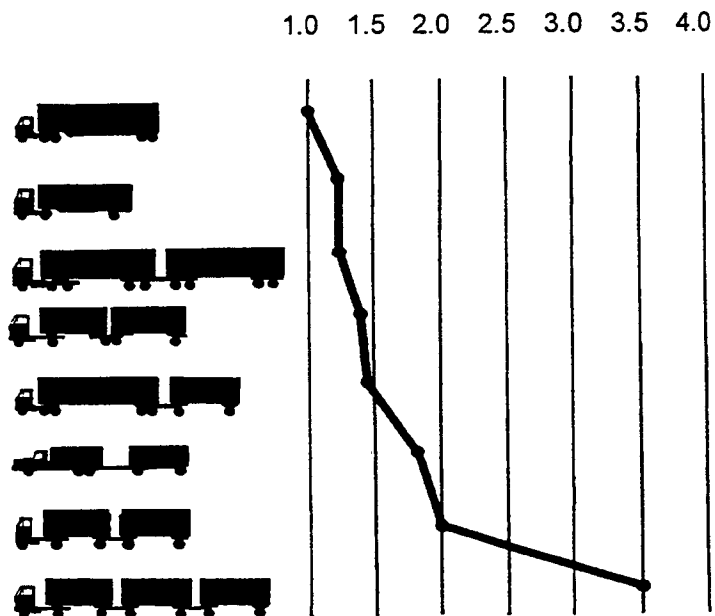
Trucks with trailers have a dangerous "crack-the-whip" effect. When you make a quick lane change, the crack-the-whip effect can turn the trailer over. There are many accidents where only the trailer has overturned.

"Rearward amplification" causes the crack-the-whip effect. Figure 24 shows eight types of combination vehicles and the rearward amplification each has in a quick lane change. Rigs with the least crack-the-whip effect are shown at the top and those with the most, at the bottom. Rearward amplification of 2.0 in the chart means that the rear trailer is twice as likely to turn over as the tractor. You can

see that triples have a rearward amplification of 3.5. This means you can roll the last trailer of triples 3.5 times as easily as a five-axle tractor-semi.

Figure 24: Influence of Combination Type on Rearward Amplification

5 axle tractor-semitrailer with 45 ft. trailer
 3 axle tractor-semitrailer with 27 ft. trailer
 Turnpike double 45 ft. trailers
 B-train double 27 ft. trailers
 Rocky mountain double 45 ft. & 27 ft. trailers
 California truck full trailer
 65 ft. conventional double 27 ft. trailers
 Triple 27 ft. trailers



(from R.D. Ervin, R.L. Nisonger, C.C. MacAdam, and P.S. Fancher, "Influence of size and weight variables on the stability and control properties of heavy trucks", University of Michigan Transportation Research Institute, 1983.)

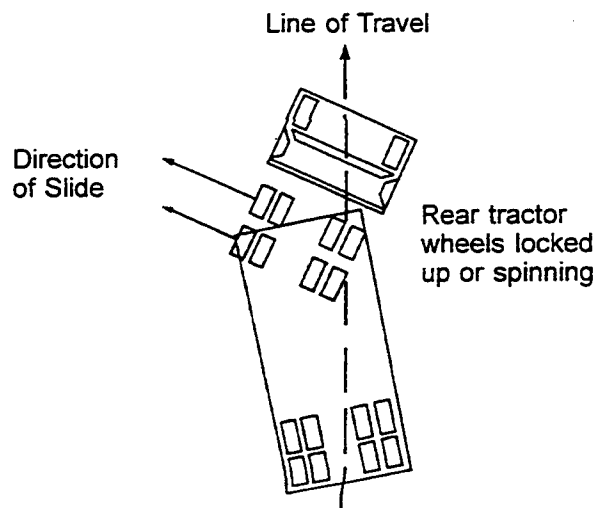
Steer gently and smoothly when you are pulling trailers. If you make a sudden movement with your steering wheel, your trailer could tip over. Follow far enough behind other vehicles (at least one second for each ten feet of your vehicle length, plus another second if going over 40 mph). Look far enough down the road to avoid being surprised and having to make a sudden lane change. At night, drive slowly enough to see obstacles with your headlights before it is too late to change lanes or stop gently. Slow down to a safe speed **before** going into a turn.

Brake Early

Control your speed whether fully loaded or empty. Large combination vehicles take longer to stop when they are empty than when they are fully loaded. When lightly loaded, the very stiff suspension springs and strong brakes give poor traction and make it very easy to lock up the wheels. Your trailer can swing out and strike other vehicles. Your tractor can jackknife very quickly as shown in Figure 25. You also must be very careful about driving "bobtail" tractors (tractors without semitrailers). Tests have shown that bobtails can be very hard to stop smoothly. It takes them longer to stop than a tractor-semitrailer loaded to maximum gross weight.

In any combination rig, allow lots of following distance and look far ahead, so you can brake early. Don't be caught by surprise and have to make a "panic" stop.

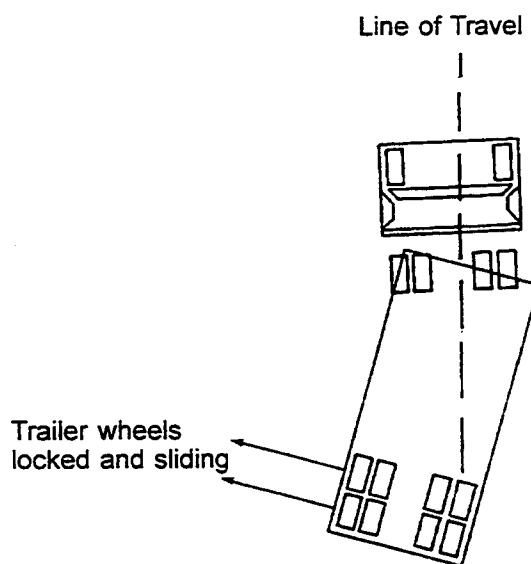
Figure 25: Tractor Jackknife



Prevent Trailer Skids

When the wheels of a trailer lock up, the trailer will tend to swing around. This is more likely to happen when the trailer is empty or lightly loaded. This type of jackknife is often called a "trailer jackknife." This is shown in Figure 26.

Figure 26: Trailer Jackknife



The procedure for stopping a trailer skid is as follows:

Recognize the skid. The earliest and best way to recognize that the trailer has started to skid is by seeing it in your mirrors. Any time you apply the brakes hard, check the mirrors to make sure the trailer is staying where it should be. Once the trailer swings out of your lane, it's very difficult to prevent a jackknife.

Stop using the brake. Release the brakes to get traction back. Do **not** use the trailer hand brake (if you have one) to "straighten out the rig." This is the wrong thing to do since the brakes on the trailer wheels caused the skid in the first place. Once the trailer wheels grip

the road again, the trailer will start to follow the tractor and straighten out.

Turn Wide

When a vehicle goes around a corner, the rear wheels follow a different path than the front wheels. This is called **offtracking** or "cheating." Figure 27 shows how offtracking causes the path followed by a tractor-semi to be wider than the rig itself. Longer vehicles will offtrack more. The rear wheels of the powered unit (truck or tractor) will offtrack some, and the rear wheels of the trailer will offtrack even more. If there is more than one trailer, the rear wheels of the last trailer will offtrack the most. Steer the front end wide enough around a corner so the rear end does not run over the curb, pedestrians, other vehicles, etc. However, keep the rear of your vehicle close to the curb. This will stop other drivers from passing you on the right. If you cannot complete your turn without entering another traffic lane, turn wide as you **complete the turn** as shown in Figure 28. This is better than swinging wide to the left before starting the turn because it will keep other drivers from passing you on the right. If drivers pass on the right, you might collide with them when you turn.

Figure 27: Offtracking in a 90-degree turn

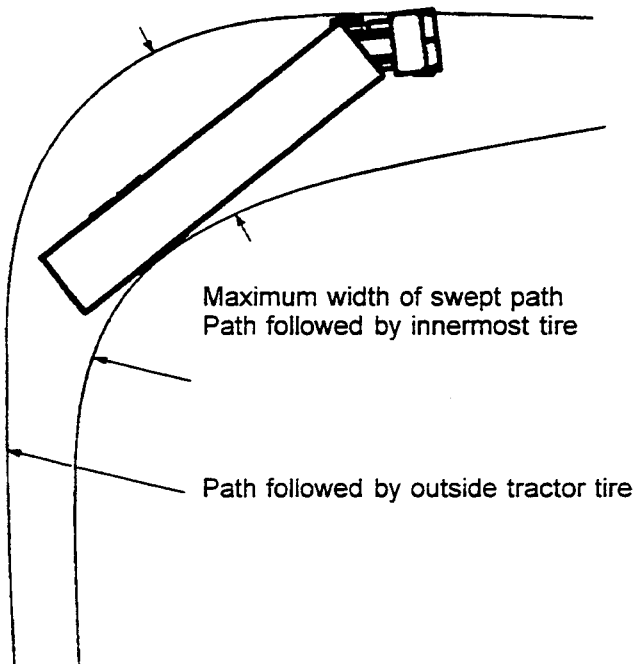
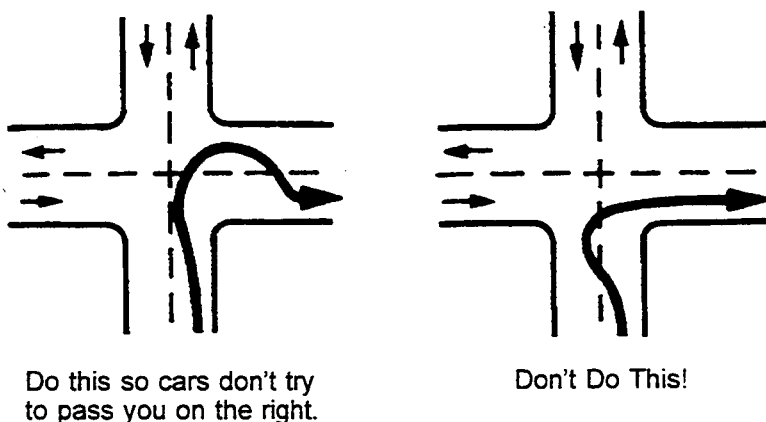


Figure 28: Right Turns



Test Your Knowledge

1. What two things are important to prevent rollover?
2. When you turn suddenly while pulling doubles, which trailer is most likely to turn over?
3. Why should you not use the trailer hand brake to straighten out a jackknifing trailer?
4. What is offtracking?
5. Why should you turn like it shows in Figure 28?

These questions may be on the test. If you are unable to answer all of the questions, re-read 6.1 DRIVING COMBINATION VEHICLES SAFELY.

6.2 COMBINATION VEHICLE AIR BRAKES

You should study "Section 5: Single Vehicle Air Brakes" before reading this. In combination vehicles the braking system has parts to control the trailer brakes, in addition to the parts described in Section 5. These parts are described below:

Trailer Hand Valve

The trailer hand valve (also called the trolley valve or Johnson bar) works the trailer brakes. The trailer hand valve should be used only to test the trailer brakes. Do **not** use it in driving because of the danger of making the trailer skid. The foot brake sends air to **all** of the brakes on the vehicle (including the trailer(s)). There is much less danger of causing a skid or jackknife when using just the foot brake.

Never use the hand valve for parking because all the air might leak out unlocking the brakes (in trailers that don't have spring brakes). Always use the **parking brakes** when parking. If the trailer does not have spring brakes, use wheel chocks to keep the trailer from moving.

Tractor Protection Valve

The tractor protection valve keeps air in the tractor or truck should the trailer break away or develop a bad leak. The tractor protection valve is controlled by the "trailer air supply" control valve in the cab. The control valve allows you to open and shut the tractor protection valve. The tractor protection valve will close automatically if air pressure is low (in the range of 20 to 45 psi). When the tractor protection valve closes, it stops any air from going out of the tractor. It also lets the air out of the trailer emergency line. This causes the trailer emergency brakes to come on. (Emergency brakes are covered later.)

Trailer Air Supply Control

The trailer air supply control on newer vehicles is a red 8-sided knob which you use to control the tractor protection valve. You push it in to supply the trailer with air, and pull it out to shut the air off and put on the trailer emergency brakes. The valve will pop out (thus closing the tractor protection valve) when the air pressure drops into the range of 20 to 45 psi. Tractor protection valve controls or "emergency" valves on older vehicles may not operate automatically. There may be a lever rather than a knob. The "normal" position is used for pulling a trailer. The "emergency" position is used to shut the air off and put on the trailer emergency brakes.

Trailer Air Lines

Every combination vehicle has two air lines, the **service** line and the **emergency** line. They run between each vehicle (tractor to trailer, trailer to dolly, dolly to second trailer, etc.)

Service Air Line. The **service** line (also called the control line or signal line) carries air which is controlled by the foot brake or the trailer hand brake. Depending on how hard you press the foot brake or hand valve, the pressure in the service line will similarly change. The service line is connected to **relay valves**. These valves allow the trailer brakes to be applied more quickly than would otherwise be possible.

Emergency Air Line. The emergency line (also called the supply line) has two purposes. First, it supplies air to the trailer air tanks. Second, the emergency line controls the emergency brakes on combination vehicles. **Loss of air pressure** in the emergency line causes the trailer emergency brakes to come on. The pressure loss could be caused by a trailer breaking loose, thus tearing apart the emergency air hose. Or it could be caused by a hose, metal tubing, or other part which breaks, letting the air out. When the emergency line loses pressure, it also causes the tractor protection valve to close (the air supply knob will pop out).

Emergency lines are often coded with the color **red** (red hose, red couplers, or other parts) to keep from getting them mixed up with the **blue** service line.

Hose Couplers (Glad Hands)

Glad hands are coupling devices used to connect the service and emergency air lines from the truck or tractor to the trailer. The couplers have a rubber seal which prevents air from escaping.

Clean the couplers and rubber seals before a connection is made. When connecting the glad hands, press the two seals together with

the couplers at a 90 degree angle to each other. A turn of the glad hand attached to the hose will join and lock the couplers.

Some vehicles have "dead end" or dummy couplers to which the hoses may be attached when they are not in use. This will prevent water and dirt from getting into the coupler and the air lines. Use the dummy couplers when the air lines are not connected to a trailer. If there are no dummy couplers, the glad hands can sometimes be locked together (depending on the couplings). It is very important to keep the air supply clean.

When coupling, make sure to couple the proper glad hands together. To help avoid mistakes, colors are sometimes used. Blue is used for the service lines and red for the emergency (supply) lines. Sometimes, metal tags are attached to the lines with the words "service" and "emergency" stamped on them.

If you do cross the air lines, supply air will be sent to the service line instead of going to charge the trailer air tanks. Air will not be available to release the trailer spring brakes (parking brakes). If the spring brakes don't release when you push the trailer air supply control, check the air line connections.

Older trailers do not have spring brakes. If the air supply in the trailer air tank has leaked away there will be no emergency brakes, and the trailer wheels will turn freely. If you crossed the air lines, you could drive away but you wouldn't have trailer brakes. **This would be very dangerous.** Always test the trailer brakes before driving with the hand valve or by pulling the air supply (tractor protection valve) control. Pull gently against them in a low gear to make sure the brakes work.

Trailer Air Tanks

Each trailer and converter dolly has one or more air tanks. They are filled by the **emergency (supply) line** from the tractor. They provide the air pressure used to operate trailer brakes. Air pressure is sent from the air tanks to the brakes by relay valves. The pressure in the **service line tells** how much pressure the relay valves should send to the trailer brakes. The pressure in the service line is controlled by the brake pedal (and the trailer hand brake).

It is important that you don't let water and oil build up in the air tanks. If you do, the brakes may not work correctly. Each tank has a drain valve on it and you should drain each tank every day. If your tanks have automatic drains, they will keep most moisture out. But you should still open the drains to make sure.

Shut-Off Valves

Shut-off valves (also called cut-out cocks) are used in the service and supply air lines at the back of trailers used to tow other trailers. These valves permit closing the air lines off when another trailer is not being towed. You must check that all shut-off valves are in the **open** position except the ones at the back of the last trailer, which must be **closed**.

Trailer Service, Parking and Emergency Brakes

Newer trailers have spring brakes just like trucks and truck tractors. However, converter dollies and trailers built before 1975 are not required to have spring brakes. Those that do not have spring brakes have emergency brakes which work from the air stored in the trailer air tank. The emergency brakes come on whenever air pressure in the emergency line is lost. **These trailers have no parking brake.** The emergency brakes come on whenever the air supply knob is pulled out or the trailer is disconnected. But the brakes will hold only as long as there is air pressure in the trailer air tank. Eventually, the air will leak away and then there will be no brakes. Therefore, **it is very important for safety that you use wheel chocks when you park trailers without spring brakes.**

A major leak in the **emergency** line will cause the tractor protection valve to close and the trailer emergency brakes to come on.

You may not notice a major leak in the **service** line until you try to put the brakes on. Then, the air loss from the leak will lower the air tank pressure quickly. If it goes low enough, the trailer emergency brakes will come on.

Test Your Knowledge

1. Why should you not use the trailer hand valve while driving?
2. Describe what the trailer air supply control does.
3. Describe what the service line is for.
4. What is the emergency air line for?
5. Why should you use chocks when parking a trailer without spring brakes?
6. Where are shut-off valves?

These questions may be on the test. If you are unable to answer all of the questions, re-read **6.2 COMBINATION VEHICLE AIR BRAKES.**

6.3 COUPLING AND UNCOUPLING

Knowing how to couple and uncouple correctly is basic to safe operation of combination vehicles. Wrong coupling and uncoupling can be very dangerous. General coupling and uncoupling steps are listed below. There are differences between different rigs, so learn the details of coupling and uncoupling the truck(s) you will operate.

Coupling Tractor Semi-Trailers

Step 1. Inspect Fifth Wheel

- Check for damaged / missing parts
- Check to see that the mounting to tractor is secure, no cracks in frame, etc.
- Be sure that the fifth wheel plate is greased as required. Failure to keep the fifth wheel plate lubricated could cause steering problems because of friction between the tractor and trailer
- Check to see that the fifth wheel is in proper position for coupling
 - Wheel tilted down towards rear of tractor
 - Jaws open
 - Safety unlocking handle in the automatic lock position
- If the tractor has a sliding fifth wheel, make sure it is locked
- Make sure the trailer kingpin is not bent or broken.

Step 2. Inspect Area and Chock Wheels

- Make sure area around the vehicle is clear
- Be sure trailer wheels are chocked or spring brakes are on
- Check that cargo (if any) is secured against movement due to tractor being coupled to the trailer.

Step 3. Position Tractor

- Put the tractor directly in front of the trailer. (Never back under the trailer at an angle because you might push the trailer sideways and break the landing gear)
- Check position, using outside mirrors, by looking down both sides of the trailer.

Step 4. Back Slowly

- Back until fifth wheel just touches the trailer
- Don't hit the trailer.

Step 5. Secure Tractor

- Put on the parking brake
- Put transmission in neutral.

Step 6. Check Trailer Height

- The trailer should be low enough that it is raised slightly by the tractor when the tractor is backed under it. Raise or lower the trailer as needed. (If the trailer is too low, the tractor may strike and damage nose of the trailer; if the trailer is too high, **it may not couple correctly**)
- Check that the kingpin and fifth wheel are aligned.

Step 7. Connect Air Lines to Trailer

- Check glad hand seals and connect tractor emergency air line to trailer emergency glad hand
- Check glad hand seals and connect tractor service air line to trailer service glad hand

- Make sure air lines are safely supported where they won't be crushed or caught while tractor is backing under the trailer.

Step 8. Supply Air to Trailer

- From cab, push in "air supply" knob or move tractor protection valve control from the "emergency" to the "normal" position to supply air to the trailer brake system.
- Wait until the air pressure is normal.
- Check brake system for crossed air lines.
 - Shut engine off so you can hear the brakes.
 - Apply and release trailer brakes and listen for sound of trailer brakes being applied and released. You should hear the brakes move when applied and air escape when the brakes are released.
 - Check air brake system pressure gauge for signs of major air loss.
- When you are sure trailer brakes are working, start engine.
- Make sure air pressure is up to normal.

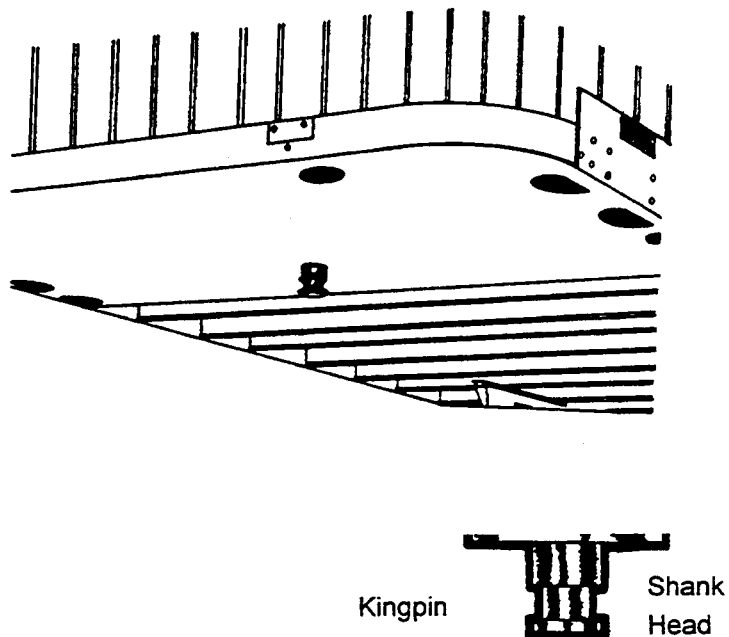
Step 9. Lock Trailer Brakes

- Pull out the "air supply" knob or move the tractor protection valve control from "normal" to "emergency."

Step 10. Back Under Trailer

- Use lowest reverse gear.
- Back tractor slowly under trailer to avoid hitting the kingpin too hard.
- Stop when the kingpin is locked into the fifth wheel.

Figure 29: Trailer Kingpin



Step 11. Check Connection for Security

- Raise trailer landing gear **slightly** off ground.
- Pull tractor **gently** forward while the trailer brakes are still locked to check that the trailer is locked onto the tractor.

Step 12. Secure Vehicle

- Put transmission in neutral.
- Put parking brakes on.
- Shut off engine and **take key with you so someone else won't move truck while you are under it.**

Step 13. Inspect Coupling

- Use a flashlight, if necessary.
- Make sure there is **no space between upper and lower fifth wheel**. If there is space, something is wrong (kingpin may be on **top** of closed fifth wheel jaws; trailer would come loose very easily).
- Go under trailer and look into the back of the fifth wheel. Make sure the fifth wheel jaws have closed around the shank of the kingpin as shown in Figure 29.
- Check that the locking lever is in the "lock" position.
- Check that the safety latch is in position over locking lever. (On some fifth wheels the catch must be put in place by hand.)
- If the coupling isn't right, **don't drive the coupled unit**; get it fixed.

Step 14. Connect the Electrical Cord and Check Air Lines

- Plug the electrical cord into the trailer and fasten the safety catch.
- Check both air lines and electrical line for signs of damage.
- Make sure air and electrical lines will not hit any moving parts of vehicle.

Step 15. Raise Front Trailer Supports (Landing Gear)

- Use low gear range (if so equipped) to begin raising the landing gear. Once free of weight, switch to the high gear range.
- Raise the landing gear all the way up. (Never drive with landing gear only part way up as it may catch on railroad tracks or other things.)
- After raising landing gear, secure the crank handle safely.
- When full weight of trailer is resting on tractor:
 - Check for enough clearance between rear of tractor frame and landing gear. (When tractor turns sharply, it must not hit landing gear.)
 - Check that there is enough clearance between the top of the tractor tires and the nose of the trailer.

Step 16. Remove Trailer Wheel Chocks

- Remove and store wheel chocks in a safe place.

Uncoupling Tractor Semi-Trailer

The following steps will help you to uncouple safely:

Step 1. Position Rig

- Make sure surface of parking area can support weight of trailer.
- Have tractor lined up with the trailer. (Pulling out at an angle can damage landing gear.)

Step 2. Ease Pressure on Locking Jaws

- Shut off trailer air supply to lock trailer brakes.
- Ease pressure on fifth wheel locking jaws by backing up gently. (This will help you release the fifth wheel locking lever.)
- Put parking brakes on while tractor is pushing against the kingpin. (This will hold rig with pressure off the locking jaws.)

Step 3. Chock Trailer Wheels

- Chock the trailer wheels if the trailer doesn't have spring brakes or if you're not sure. (The air could leak out of the trailer air tank, releasing its emergency brakes. Without chocks, the trailer could move.)

Step 4. Lower the Landing Gear

- If trailer is empty - lower the landing gear until it makes firm contact with the ground.
- If trailer is loaded, after the landing gear makes firm contact with the ground, turn crank in low gear a few extra turns. This will lift some weight off the tractor. (Do not lift trailer off the fifth wheel.) This will:
 - Make it easier to unlatch fifth wheel;
 - Make it easier to couple next time.

Step 5. Disconnect Air Lines and Electrical Cable

- Disconnect air lines from trailer. Connect air line glad hands to dummy couplers at back of cab or couple them together.
- Hang electrical cable with plug down to prevent moisture from entering it.
- Make sure lines are supported so they won't be damaged while driving the tractor.

Step 6. Unlock Fifth Wheel

- Raise the release handle lock.
- Pull the release handle to "open" position.
- Keep legs and feet clear of the rear tractor wheels to avoid serious injury in case the vehicle moves.

Step 7. Pull Tractor Partially Clear of Trailer

- Pull tractor forward until fifth wheel comes out from under the trailer.
- Stop with tractor frame under trailer (prevents trailer from falling to ground if landing gear should collapse or sink).

Step 8. Secure Tractor

- Apply parking brake
- Place transmission in neutral.

Step 9. Inspect Trailer Supports

- Make sure ground is supporting trailer
- Make sure landing gear is not damaged.

Step 10. Pull Tractor Clear of Trailer

- Release parking brakes
- Check the area and drive tractor forward until it clears.

Test Your Knowledge

1. What might happen if the trailer is too high when you try to couple?
2. After coupling, how much space should be between the upper and lower fifth wheel?
3. You should look into the back of the fifth wheel to see if it is locked onto the kingpin. True or False?
4. To drive you need to raise the landing gear only until it just lifts off the pavement. True or False?
5. What is a converter dolly?

These questions may be on the test. If you are unable to answer all of the questions, re-read 6.3 COUPLING AND UNCOUPLING.

6.4 INSPECTING A COMBINATION VEHICLE

Use the seven-step inspection procedure described in Section 2 to inspect your combination vehicle. There are more things to inspect on a combination vehicle than on a single vehicle. (For example, tires, wheels, lights, reflectors, etc.) However, there are also some new things to check. These are discussed below.

Do these checks in addition to those already listed in Section 2, "Step 5: Do Walkaround Inspection".

Additional Things to Check During a

Coupling System Areas

- Check fifth wheel (lower)
 - Securely mounted to frame

Walkaround Inspection

- No missing, damaged parts
- Enough grease
- No visible space between upper and lower fifth wheel
- Locking jaws around the shank, **not** the head of kingpin
- Release arm properly seated and safety latch/lock engaged.
- Fifth wheel (upper)
 - Glide plate securely mounted to trailer frame
 - Kingpin not damaged.
- Air and electric lines to trailer
 - Electrical cord firmly plugged in and secured
 - Air lines properly connected to glad hands, no air leaks, properly secured with enough slack for turns
 - All lines free from damage.
- Sliding fifth wheel
 - Slide not damaged or parts missing
 - Properly greased
 - All locking pins present and locked in place
 - If air powered - no air leaks
 - Check that fifth wheel is not so far forward that tractor frame will hit landing gear or the cab hit the trailer, during turns.

Landing Gear

- Fully raised, no missing parts, not bent or otherwise damaged
- Crank handle in place and secured
- If power operated, no air or hydraulic leaks.

6.5 PRE-TRIP INSPECTION

Do these checks **in addition** to Section 5.3, Inspecting Air Brake Systems.

The following section explains how to check air brakes on combination vehicles. Check the brakes on a double or triple trailer as you would any combination vehicle.

Combination Vehicle Brake Check

Check that Air Flows to All Trailers. Use the tractor parking brake and/or chock the wheels to hold the vehicle. Wait for air pressure to reach normal, then push in the red "trailer air supply" knob. This will supply air to the emergency (supply) lines. Use the trailer handbrake to provide air to the service line. Go to the rear of the rig. Open the emergency line shut-off valve at the rear of the last trailer. You should hear air escaping, showing the entire system is charged. Close the emergency line valve. Open the service line valve to check that service pressure goes through all the trailers (this test assumes that the trailer handbrake or the service brake pedal is on), then close the valve. If you do NOT hear air escaping from both lines, check that the

shut-off valves on the trailer(s) and dolly(s) are in the OPEN position. You **MUST** have air all the way to the back for all the brakes to work.

Test Tractor Protection Valve. Charge the trailer air brake system. (That is, build up normal air pressure and push the "air supply" knob in). Shut the engine off. Step on and off the brake pedal several times to reduce the air pressure in the tanks. The trailer air supply control (also called the tractor protection valve control) should pop out (or go from "normal" to "emergency" position) when the air pressure falls into the pressure range specified by the manufacturer. (Usually within the range of 20 to 45 psi.)

If the tractor protection valve doesn't work right, an air hose or trailer brake leak could drain all the air from the tractor. This would cause the emergency brakes to come on, with possible loss of control.

Test Trailer Emergency Brakes. Charge the trailer air brake system and check that the trailer rolls freely. Then stop and pull out the trailer air supply control (also called tractor protection valve control or trailer emergency valve) or place it in the "emergency" position. Pull gently on the trailer with the tractor to check that the trailer emergency brakes are on.

Test Trailer Service Brakes. Check for normal air pressure, release the parking brakes, move the vehicle forward slowly and apply trailer brakes with the hand control (trolley valve), if so equipped. You should feel the brakes come on. This tells you the trailer brakes are connected and working. (The trailer brakes should be tested with the hand valve but controlled in normal operation with the foot pedal, which applies air to the service brakes at all wheels.)

Test Your Knowledge

1. Which shut-off valves should be open and which closed?
2. How can you test that air flows to all trailers?
3. How can you test the tractor protection valve?
4. How can you test the trailer emergency brakes?
5. How can you test the trailer service brakes?

These questions may be on the test. If you are unable to answer all of the questions, re-read **6.4 INSPECTING A COMBINATION VEHICLE AND 6.5 PRE-TRIP INSPECTION.**

SECTION 7: DOUBLES AND TRIPLES

This Section Covers

Pulling Double / Triple Trailers
Coupling & Uncoupling
Inspecting Doubles and Triples
Checking Air Brakes

Introduction

This section has information you need to pass the CDL knowledge test for driving safely with double and triple trailers. It tells you how important it is to be very careful when driving with more than one trailer, how to couple and uncouple correctly, and how to inspect doubles and triples safely. (You should also study Sections 2, 5 and 6.)

7.1 PULLING DOUBLE / TRIPLE TRAILERS

Take special care when pulling two and three trailers. There are more things that can go wrong, and doubles/triples are less stable than other commercial vehicles. Some areas of concern are discussed below.

Prevent Trailers From Rolling Over

To prevent trailers from rolling over, you must steer gently and go slowly around corners, on-ramps, off-ramps, and curves. A safe speed on a curve for a straight truck or a single trailer combination vehicle may be too fast for a set of doubles or triples.

Beware of the Crack-The-Whip Effect

Doubles and triples are more likely to turn over than other combination vehicles because of the "crack-the-whip" effect. You must steer gently when pulling trailers. The last trailer in a combination is most likely to turn over. If you don't understand the crack-the-whip effect, study section 6.1 and review figure 6-1 in the Combination Vehicles section of this manual.

Inspect Completely

There are more critical parts to check when you have two or three trailers. Check them all. Follow the procedures described later in this section.

Look Far Ahead

Doubles and triples must be driven very smoothly to avoid rollover or jackknife. Therefore, **look far ahead** so you can slow down or change lanes gradually when necessary.

Manage Space

Doubles and triples take up more space than other commercial vehicles. They are not only longer, but also need more space because they can't be turned or stopped suddenly. Allow more following distance. Make sure you have large enough gaps before entering or crossing traffic. Be certain you are clear at the sides before changing lanes.

Adverse Conditions

Be more careful in adverse conditions. In bad weather, slippery conditions, and mountain driving, you must be especially careful if you drive double and triple bottoms. You will have greater length and

more dead axles to pull with your drive axles than other drivers. There is more chance for skids and loss of traction.

7.2 COUPLING AND UNCOUPLING

Knowing how to couple and uncouple correctly is basic to safe operation of doubles and triples. Wrong coupling and uncoupling can be very dangerous. Coupling and uncoupling steps for doubles and triples are listed below:

Coupling Twin Trailers

Secure Second (Rear) Trailer.

- If the second trailer doesn't have spring brakes, drive the tractor close to the trailer, connect the emergency line, charge the trailer air tank, and disconnect the emergency line. This will set the trailer emergency brakes (if the slack adjusters are correctly adjusted). Chock the wheels if you have any doubt about the brakes.

Couple Tractor and First Semi-Trailer as Described Earlier.

SAFETY NOTE

For the safest handling on the road, the more heavily loaded semi-trailer should be in first position behind the tractor. The lighter trailer should be in the rear.

- A converter gear or dolly is a coupling device of one or two axles and a fifth wheel by which a semi-trailer can be coupled to the rear of a tractor-trailer combination forming a double bottom rig.

Position Converter Dolly in Front of Second (Rear) Trailer.

- Release dolly brakes by opening the air tank petcock. (Or, if the dolly has spring brakes, use the dolly parking brake control.)
- If the distance is not too great, wheel the dolly into position by hand so it is in line with the kingpin.
- Or, use the tractor and first semi-trailer to pick up the converter dolly:
 - Position combination as close as possible to converter dolly.
 - Move dolly to rear of first semi-trailer and couple it to the trailer.
 - Lock pintle hook.
 - Secure dolly support in raised position.
 - Pull dolly into position as close as possible to nose of the second semi-trailer.
 - Lower dolly support.
 - Unhook dolly from first trailer.

- Wheel dolly into position in front of second trailer in line with the kingpin.

Connect Converter Dolly to Front Trailer.

- Back first semi-trailer into position in front of dolly tongue.
- Hook dolly to front trailer.
- Lock pintle hook.
- Secure converter gear support in raised position.

Connect Converter Dolly to Rear Trailer.

- Make sure trailer brakes are locked and/or wheels chocked.
- Make sure trailer height is correct. (It must be slightly lower than the center of the fifth wheel, so trailer is raised slightly when dolly is pushed under.)
- Back converter dolly under rear trailer.
- Raise landing gear slightly off ground to prevent damage if trailer moves.
- Test coupling by pulling against pin of number two semi-trailer.
- Make visual check of coupling. (No space between upper and lower fifth wheel. Locking jaws closed on kingpin.)
- Connect safety chains, air hoses, and light cords.
- Close converter dolly air tank petcock and shut-off valves at rear of second trailer (service and emergency shut-offs).
- Open shut-off valves at rear of first trailer (and on dolly if so equipped).
- Raise landing gear completely.
- Charge trailers (push "air supply" knob in) and check for air at rear of second trailer by opening the emergency line shut-off. If air pressure isn't there, something is wrong and the brakes won't work.

Uncoupling Twin Trailers

Uncouple Rear Trailer.

- Park rig in a straight line on firm level ground.
- Apply parking brakes so rig won't move.
- Chock wheels of second trailer if it doesn't have spring brakes.
- Lower landing gear of second semi-trailer enough to remove some weight from dolly.
- Close air shut-offs at rear of first semi-trailer (and on dolly if so equipped).
- Disconnect all dolly air and electric lines and secure them.
- Release dolly brakes.
- Release converter dolly fifth wheel latch.
- Slowly pull tractor, first semi-trailer, and dolly forward to pull dolly out from under rear semi-trailer.

Uncouple Converter Dolly.

- Lower dolly landing gear
- Disconnect safety chains

- Apply converter gear spring brakes or chock wheels
- Release pintle hook on first semi-trailer
- Slowly pull clear of dolly.

SAFETY NOTE

Never unlock the pintle hook with the dolly still under the rear trailer. The dolly tow bar may fly up, possibly causing injury, and making it very difficult to re-couple.

Coupling & Uncoupling Triple Trailers

Couple Second and Third Trailers.

- Couple second and third trailers using the method for coupling doubles.
- Uncouple tractor and pull away from second and third trailers.

Couple Tractor/First Semi-Trailer to Second/Third Trailers.

- Couple tractor to first trailer. Use the method already described for coupling tractor semi-trailers.
- Move converter dolly into position and couple first trailer to second trailer using the method for coupling doubles. Triples rig is now complete.

Uncouple Triple-Trailer Rig.

- Uncouple third trailer by pulling the dolly out, then unhitching the dolly using the method for uncoupling doubles.
- Uncouple remainder of rig as you would any double-bottom rig using the method already described.

Coupling & Uncoupling Other Combinations

The methods described so far apply to the more common tractor-trailer combinations. However, there are other ways of coupling and uncoupling the many types of truck-trailer and tractor-trailer combinations that are in use. There are too many to cover in this manual. Learn the right way to couple the vehicle(s) you will drive according to the manufacturer and/or owner.

7.3 INSPECTING DOUBLES AND TRIPLES

Use the seven-step inspection procedure described in Section 2 to inspect your combination vehicle. There are more things to inspect on a combination vehicle than on a single vehicle. Many of these items are simply more of what you would find on a single vehicle. (For example, tires, wheels, lights, reflectors, etc.) However, there are also some new things to check. These are discussed below.

Additional Things To Check During a Walkaround Inspection

Do these checks in addition to those already listed in Section 2, "Step 5: Do Walkaround Inspection".

Coupling System Areas

- Check fifth wheel (lower)
 - Securely mounted to frame
 - No missing, damaged parts
 - Enough grease
 - No visible space between upper and lower fifth wheel
 - Locking jaws around the shank, **not** the head of kingpin
 - Release arm properly seated and safety latch/lock engaged.
- Fifth wheel (upper)
 - Glide plate securely mounted to trailer frame
 - Kingpin not damaged.
- Air and electric lines to trailer
 - Electrical cord firmly plugged in and secured
 - Air lines properly connected to glad hands, no air leaks, properly secured with enough slack for turns
 - All lines free from damage.
- Sliding fifth wheel
 - Slide not damaged or parts missing
 - Properly greased
 - All locking pins present and locked in place
 - If air powered - no air leaks
 - Check that fifth wheel is not so far forward that tractor frame will hit landing gear, or cab hit the trailer, during turns.

Landing Gear

- Fully raised, no missing parts, not bent or otherwise damaged
- Crank handle in place and secured
- If power operated, no air or hydraulic leaks.

Double and Triple Trailers

- Shut-off valves (at rear of trailers, in service and emergency lines):
 - Rear of front trailers: OPEN
 - Rear of last trailer: CLOSED
 - Converter dolly air tank drain valve: CLOSED
- Be sure air lines are supported and glad hands are properly connected
- If spare tire is carried on converter gear (dolly), make sure it's secured
- Be sure pintle-eye of dolly is in place in pintle hook of trailer(s)
- Make sure pintle hook is latched
- Safety chains should be secured to trailer(s)
- Be sure light cords are firmly in sockets on trailers.

Do these checks in **addition** to Section 5.3, "Inspecting Air Brake Systems."

7.4 DOUBLES/TRIPLES AIR BRAKE CHECK

Check the brakes on a double or triple trailer as you would any combination vehicle. Section 6.2 explains how to check air brakes on combination vehicles. You must also make the following checks on your double or triple trailers:

Check That Air Flows to All Trailers (Double and Triple Trailers)

Use the tractor parking brake and/or chock the wheels to hold the vehicle. Wait for air pressure to reach normal, then push in the red "trailer air supply" knob. This will supply air to the emergency (supply) lines. Use the trailer handbrake to provide air to the service line. Go to the rear of the rig. Open the emergency line shut-off valve at the rear of the last trailer. You should hear air escaping, showing the entire system is charged. Close the emergency line valve. Open the service line valve to check that service pressure goes through all the trailers (this test assumes that the trailer handbrake or the service brake pedal is on), then close the valve. If you do NOT hear air escaping from both lines, check that the shut-off valves on the trailer(s) and dolly(s) are in the OPEN position. You **MUST** have air all the way to the back for all the brakes to work.

Test Tractor Protection Valve

Charge the trailer air brake system. (That is, build up normal air pressure and push the "air supply" knob in.) Shut the engine off. Step on and off the brake pedal several times to reduce the air pressure in the tanks. The trailer air supply control (also called the tractor protection valve control) should pop out (or go from "normal" to "emergency" position) when the air pressure falls into the pressure range specified by the manufacturer. (Usually within the range of 20 to 45 psi.)

If the tractor protection valve doesn't work right, an air hose or trailer brake leak could drain all the air from the tractor. This would cause the emergency brakes to come on, with possible loss of control.

Test Trailer Emergency Brakes

Charge the trailer air brake system and check that the trailer rolls freely. Then stop and pull out the trailer air supply control (also called tractor protection valve control or trailer emergency valve) or place it in the "emergency" position. Pull gently on the trailer with the tractor to check that the trailer emergency brakes are on.

Test Trailer Service Brakes

Check for normal air pressure, release the parking brakes, move the vehicle forward slowly, and apply trailer brakes with the hand control (trolley valve), if so equipped. You should feel the brakes come on. This tells you the trailer brakes are connected and working. (The trailer brakes should be tested with the hand valve, but controlled in normal operation with the foot pedal, which applies air to the service brakes at all wheels.)

Test Your Knowledge

1. What is a converter dolly?
2. Do converter dollies have spring brakes?
3. What three methods can you use to secure a second trailer before coupling?
4. How do you check to make sure trailer height is correct before coupling?
5. What do you check when making a visual check of coupling?
6. Why should you pull a dolly out from under a trailer before you disconnect it from the trailer in front?
7. What should you check for when inspecting the converter dolly? The pintle hook?
8. Should the shut-off valves on the rear of the last trailer be open or closed? On the first trailer in a set of doubles? On the middle trailer of a set of triples?
9. How can you test that air flows to all trailers?

These questions may be on the test. If you are unable to answer all of the questions, re-read **7.1 PULLING DOUBLE / TRIPLE TRAILERS, 7.2 COUPLING AND UNCOUPLING, 7.3 INSPECTING DOUBLES AND TRIPLES AND 7.4 DOUBLES/TRIPLES AIR BRAKE CHECK.**

SECTION 8: TANK VEHICLES

This Section Covers

Inspecting Tank Vehicles
Driving Tank Vehicles

Introduction

This section has information needed to pass the CDL knowledge test for driving a tank vehicle. (You should also study Sections 2, 5, and 6). A "tank vehicle" is used to carry any liquid or liquid gas in a tank of 1000 gallons or more.

Before loading, unloading, or driving a tanker, inspect the vehicle. This makes sure that the vehicle is safe to carry the liquid or gas and is safe to drive.

8.1 INSPECTING TANK VEHICLES

Tank vehicles have special items that you need to check. Tank vehicles come in many types and sizes. You need to check the vehicle's operator's manual to make sure you know how to inspect your tank vehicle.

Leaks

On all tank vehicles, the most important item to check for is leaks. Check under and around the vehicle for signs of any leaking. Don't carry liquids or gases in a leaking tank. In general, check the following:

- Check the tank's body or shell for dents or leaks.
- Check the intake, discharge, and cut-off valves. Make sure the valves are in the correct position before loading, unloading, or moving the vehicle.
- Check pipes, connections, and hoses for leaks, especially around joints.
- Check manhole covers and vents. Make sure the covers have gaskets and they close correctly. Keep the vents clear so they work correctly.
- Check special purpose equipment. If your vehicle has any of the following equipment, make sure it works:
 - Vapor recovery kits
 - Grounding and bonding cables
 - Emergency shut-off systems
 - Built in fire extinguisher.

Make sure you know how to operate your special equipment.

- Check the emergency equipment required for your vehicle. Find out what equipment you're required to carry and make sure you have it (and it works).

8.2 DRIVING TANK VEHICLES

Hauling liquids in tanks requires special skills because of the high center of gravity and liquid movement.

High Center of Gravity

High center of gravity means that much of the load's weight is carried high up off the road. This makes the vehicle top-heavy and easy to roll over. Liquid tankers are especially easy to roll over. Tests have shown that tankers can turn over at the speed limits posted for curves. Take highway curves and on-ramp/off-ramp curves well below the posted speeds.

Danger of Surge

Liquid surge results from movement of the liquid in partially filled tanks. This movement can have bad effects on handling. For example, when coming to a stop, the liquid will surge back and forth. When the wave hits the end of the tank, it tends to push the truck in the direction the wave is moving. If the truck is on a slippery surface such as ice, the wave can shove a stopped truck out into an intersection. The driver of a liquid tanker must be very familiar with the handling of the vehicle.

Bulkheads

Some liquid tanks are divided into several smaller tanks by bulkheads. When loading and unloading the smaller tanks, the driver must pay attention to weight distribution. Don't put too much weight on the front or rear of the vehicle.

Baffled Tanks

Baffled liquid tanks have bulkheads in them with holes that let the liquid flow through. The baffles help to control the forward and backward liquid surge. Side-to-side surge can still occur. This can cause a roll over.

Un-baffled Tanks

Un-baffled liquid tankers (sometimes called "smooth bore" tanks) have nothing inside to slow down the flow of the liquid. Therefore, forward-and-back surge is very strong. Un-baffled tanks are usually those that transport food products (milk, for example). (Sanitation regulations forbid the use of baffles because of the difficulty in cleaning the inside of the tank.) Be extremely cautious (slow and careful) in driving smooth bore tanks, especially when starting and stopping.

Outage

Never load a cargo tank totally full. Liquids expand as they warm and you must leave room for the expanding liquid. This is called "outage." Since different liquids expand by different amounts, they require different amounts of outage. You must know the outage requirement when hauling liquids in bulk.

How Much To Load?

A full tank of dense liquid (such as some acids) may exceed legal weight limits. For that reason, you may often only partially fill tanks with heavy liquids. The amount of liquid to load into a tank depends on:

- The amount the liquid will expand in transit
- The weight of the liquid
- Legal weight limits.

8.3 SAFE DRIVING RULES

In order to drive tank vehicles safely, you must remember to follow all the safe driving rules. A few of these rules are:

Drive smoothly

Because of the high center of gravity and the surge of the liquid, you must start, slow down, and stop very smoothly. Also, make smooth turns and lane changes.

Braking

If you must make a quick stop to avoid a crash, use controlled or stab braking. If you do not remember how to stop using these methods, review Section 2.16. Also, remember that if you steer quickly while braking, your vehicle may roll over.

Curves

Slow down before curves, then accelerate slightly through the curve. The posted speed for a curve may be too fast for a tank vehicle.

Stopping Distance

Keep in mind how much space you need to stop your vehicle. Remember that wet roads double the normal stopping distance. Empty tank vehicles may take longer to stop than full ones.

Skids

Don't over steer, over accelerate, or over brake. If you do, your vehicle may skid. On tank trailers, if your drive wheels or trailer wheels begin to skid, your vehicle may jackknife. When any vehicle starts to skid, you must take action to restore traction to the wheels.

Test Your Knowledge

1. How are **bulkheads** different than **baffles**?
2. Should a tank vehicle take curves, on-ramps, or off-ramps at the posted speed limits?
3. How are smooth bore tankers different to drive than those with baffles?
4. What three things determine how much liquid you can load?
5. What is outage?
6. What two reasons make special care necessary when driving tank vehicles?

These questions may be on the test. If you are unable to answer all of the questions, re-read 8.1 INSPECTING TANK VEHICLES, 8.2 DRIVING TANK VEHICLES AND 8.3 SAFE DRIVING RULES.